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ABSTRACT

This classroom guide uses a series of interactive lessons to provide middle and high school students with the foundation to address complex issues of how people use the environment, the factors (demographic, socioeconomic, political, and cultural) that affect human use of resources, and the local and global environmental impact of people's actions and choices. The unit includes four core lessons and two case studies. The core lessons prepare students to consider how the quest of people around the world to meet their basic needs leads to the use of resources and the production of wastes. The case studies help students move beyond the general ideas to examine how human needs and environmental stress are problems confronted by real people in Haiti and in Bangladesh. In the culminating activity, students reflect on the first three core lessons and case studies to collaborate on an action plan for responsible global citizenship. The lessons include maps and statistical data on population and environmental use. A wall chart of statistical data completes the guide. Extension activities are suggested for further research and adaptations are available for younger grades. (EH)

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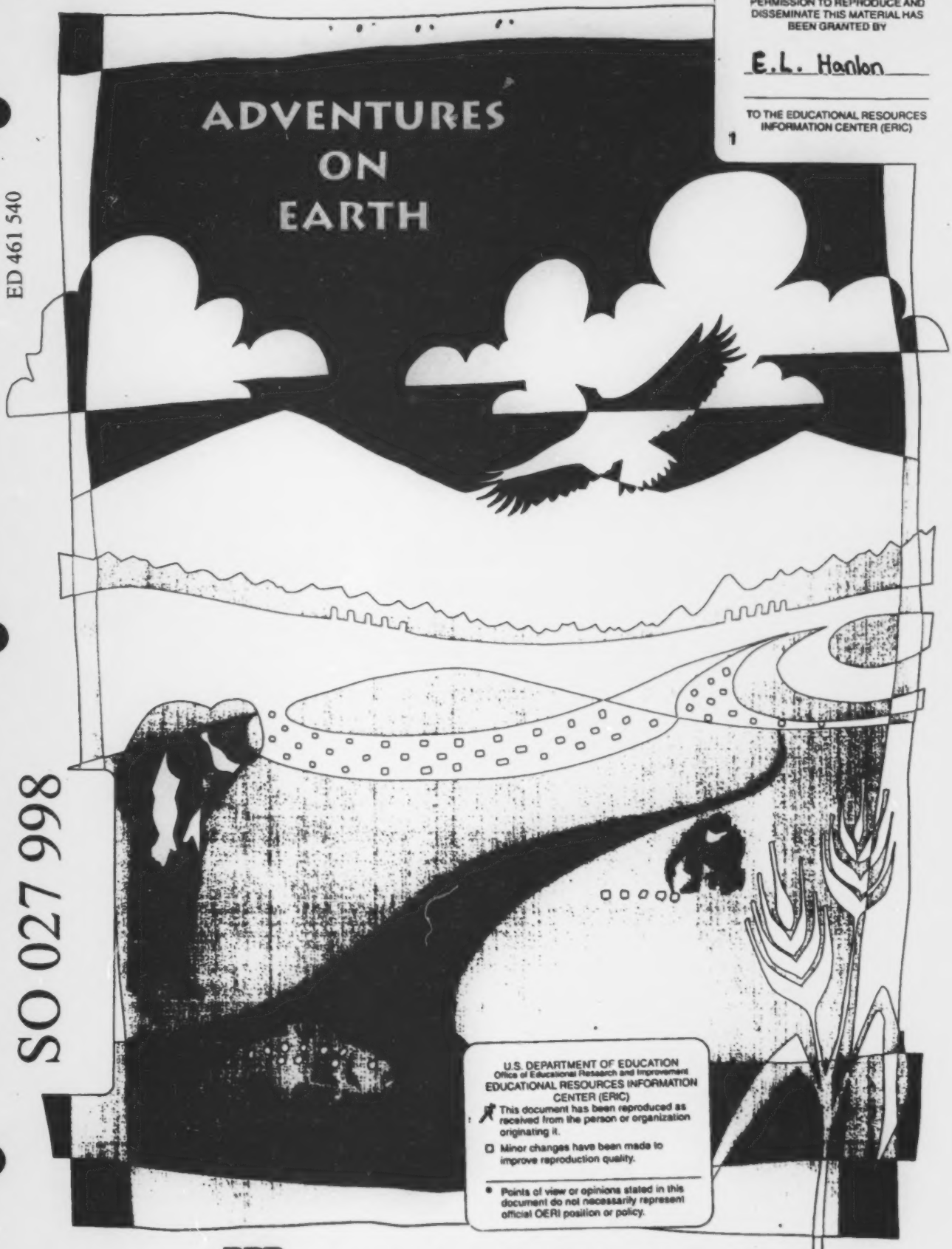

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ADVENTURES ON EARTH:
Exploring Our Global Links

A Classroom Guide

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INTRODUCTION

Dear Educator:

It is important for the future well-being of the Earth that people understand that all systems, including human systems, are connected, and that just as we all depend on the environment to meet our basic needs, so do we all share responsibility for the health of the environment. Today's young people, the world's future leaders, will be charged with finding solutions to the complex environmental challenges that now exist, and those not yet discovered.

The *Adventures on Earth: Exploring Our Global Links* classroom guide uses a series of interactive lessons to provide students with the foundation to realistically address these complex issues. The unit helps students consider how people use the environment, the factors (demographic, socioeconomic, political, and cultural) that affect human use of resources, and the local and global environmental impact of people's actions and choices. Ideally, these activities will lead students to consider how solutions to environmental problems must be addressed at local, national, and international levels.

Although intended primarily for middle and high school students, many of the learning activities can be adapted for use with younger students. Appropriate methods for adaptation are included in the "Extensions & Variations" section of each lesson. Several lessons have already been successfully tested with children as young as grade one.

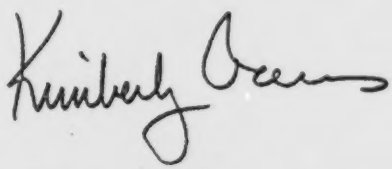
The unit includes four core lessons and two case studies. The core lessons prepare students to consider how the quest of people around the world to meet their basic needs leads to the use of resources and the production of wastes. Through data analysis, students also explore the success that people in different countries are having in meeting their basic needs.

The case studies help students move beyond the general to examine how human needs and environmental stress are problems confronted by real people in real places. The first case study assesses human needs and environmental stress in Haiti. Then students examine a global environmental issue by reviewing the potential consequences of climate change in Bangladesh.

In the culminating activity, students reflect on what they learned in the first three core lessons and in the case studies to collaborate on an action plan for responsible global citizenship. The World Population and the Environment Data Sheet poster is included in the teaching package and is used throughout the unit. A desk-size version is included in the classroom guide and may be copied for use in the classroom.

In addition to the introduction, grade level, time required, vocabulary, objectives, and materials, each lesson identifies the geography and science standards that are addressed. The lessons are comprehensive and include maps, charts, and other handouts to be duplicated for classroom use. The following skills are targeted using strategies that include collaborative problem solving, simulation, and a mock trial: mapping, data collection & analysis, role playing, organizing information, oral communication, map interpretation, critical thinking, research, and problem solving and decisionmaking.

We recommend that teachers use the first three core lessons in order, then have students (particularly older students) experience one or both of the case studies, and end with lesson four.



Kimberly Crews
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WHAT HUMANS NEED

Introduction:

Most people in the United States spend very little time each day trying to obtain the basic necessities of life: oxygen, water, food, and health. However, there are places in the world where people's entire existence is focused on meeting these basic needs. In this learning activity, students will consider the things necessary for meeting human needs and consider the results of failure to meet basic physiological needs.

Grade Level:

6-12; adaptable to lower grades (see Extensions & Variations)

Time Required:

One class period

Standards Addressed:

Geography standards

14.	*Knows and understands how human actions modify the physical environment.*

Science standards

C, grades 5-8	*Structure and function in living systems*
F, grades 5-8	*Personal health* and *Populations, resources, and environments*
F, grades 9-12	*Natural resources* and *Science and technology in local, national, and global challenges*

Skills:

This learning activity requires students to:

- ask geographic questions
- acquire geographic information
- organize geographic information
- analyze geographic information
- answer geographic questions

Vocabulary/Concepts:

stress, physiological needs, child mortality rate, per capita water availability, underweight, access to safe water and sanitation, per capita cropland availability

Objectives:

As a result of completing this learning activity, students will:

- understand the concept of "basic human needs," including oxygen, water, food, and health.
- consider the physiological, emotional, and material requirements necessary for human well-being and prosperity.
- understand the concept of "stress."
- identify a variety of indicators for stress.
- use the *World Population and the Environment Data Sheet* to find information on the availability of environmental resources.

Materials:

- 5" x 8" index cards
- Masking tape
- Copies of the *World Population and the Environment Data Sheet*
- Copies of handout: *The Earth Day Express*

The Learning Activity:

Background:

The activity that follows asks students to develop a continuum of human requirements from a list of words representing a range of physiological, emotional, and material needs and wants. The activity assumes that students have a basic understanding of the biological requirements for life, namely that:

a. animals need air, water, and food;
b. plants need air, water, nutrients, and light;
c. if any of these requirements is in short supply or is not available, life cannot exist for long.

If necessary, you may want to review these basic requirements.

WHAT HUMANS NEED *continued*

Preparing for the Activity:

Before introducing the activity, write each of the following words on 5"x 8" index cards:

books	stereo	shampoo	car	acceptance
self-esteem	bed	oxygen	friends	computer
shelter	education	health	TV	medicine
heat	food	air conditioning	clothes	refrigerator
electricity	hot water	bike	phone	toilet
tools	pets	meat	fuel	water

Introducing the Activity:

1. Distribute one card to each student in the class. (If you have fewer than 30 students, make sure that the cards that you distribute include oxygen, water, food, and health. If you have more than 30 students, add some additional words to the list.)

   Ask students to arrange the cards in priority order from most important to least important, securing each card across the top of the chalkboard with masking tape.

   You may want to place the first card somewhere in the middle to give students a reference point. Once each student has placed a card on the board, allow the class to discuss the order and, through mutual agreement and trial and error, arrange the words into a continuum, ranging from the most basic biological needs to luxury items that are not essential to basic human life.

   NOTE: The list should begin with: oxygen, water, food, health. (Students could first prioritize the list based on the necessities in their community and then consider whether the order of priorities might be different for a citizen from another country.)

   Leave the human requirements continuum up on the board for the remainder of the unit.

Executing the Activity:

2. Distribute copies of *The Earth Day Express*. This mock newspaper presents situations from around the world in which people are either not able to meet their basic needs or are under **stress** due to difficulties in meeting basic needs. Define "stress" as *a measure of the level of concern/pain caused by not being able to meet the basic human needs.*

   Briefly discuss factors that may lead to this stress. For example, stress might be created by having to walk for miles every day to obtain water that is safe to drink. Or, a lack of sewage treatment facilities may lead to a polluted water supply and an outbreak of waterborne disease. An indicator of stress could be the percentage of the population that has access to clean water. (If everyone had clean water there would be no stress, at least with respect to clean water.)

   As they read the articles, ask students to identify possible indicators of "stress" related to each of the basic needs.

3. Write the words **water**, **food**, and **health** on the board as category headings. (Omit oxygen, acknowledging to students that it is obviously a basic need, but it is readily available under current conditions.) Ask students to identify possible indicators of "stress" for each of these categories of basic needs. Place students' ideas under each category heading.

Concluding the Activity:

4. Distribute copies of the *World Population and the Environment Data Sheet*. Briefly discuss the categories, highlighting the definition of each. Younger students may require more time to become familiar with new terms.

   Ask students to consider the categories, noting similarities and differences with the ideas they have already listed on the board. Have students decide which categories relate directly to the headings on the board; then add these to the list.

WHAT HUMANS NEED *continued*

Extensions & Variations:

1. For younger students, use pictures to accompany the words on the index cards.
2. Ask a series of quick questions and have students race to locate the information in the data sheet. Questions might include:

   a. What country in Latin America has the highest child mortality rate?
   b. Which country has seen the greatest loss in per capita cropland?

3. Use the video *Apollo 13* to expand on the discussion of stress. How did the astronauts' ability or inability to obtain water, food, and health contribute to stress? Compare the plight of the astronauts to Earth's systems.
4. Have students bring in articles from the local newspaper indicating that people are not able to meet their basic needs or are under stress due to difficulties in meeting basic needs. (Or provide newspapers to the class and have them search for such articles.) Make lists of the basic needs that are not being met or of evidence of stress resulting from unmet basic needs in the community, as indicated in the articles.
5. Write data sheet terms and definitions on large index cards. Assemble a Jeopardy-style game to help students develop vocabulary for this lesson and those that follow.

Note:

Articles from *The Earth Day Express* were compiled from the following sources:

"Cholera Epidemic Claims Many in Peru" [*World Health*, July-August 1992: 18]

"Advertisement" ["The Year 2025-A Child's View," *The State of the Environment 1990: Children and the Environment,* UNEP and UNICEF: 31]

"Water, for Life's Sake" [Ajoa Yeboah-Afari and Sujaya Misra, "In Search of Water," *People and the Planet*, Vol. 2, No. 2, 1993: 6]

"Malnutrition and Infection: Research Reveals A Conspiracy" ["Unmasking Malunutrition," *The Progress of Nations,* 1995: 14]

"Less Land to Go Around" [Paul Harrison, *The Third Revolution: Environment, Population and a Sustainable World,* London: I.B. Tauris & Co Ltd., 1992: 80-81]

THE Earth Day Express

People worldwide using the environment to meet their needs.

April 1997

Water, for Life's Sake

Water is a dominating force in the lives of many people in the world's developing countries. For many African women, the trek for water is at the top of the daily list of work. Mbekiga Kimulu from Kenya walks two kilometers to the well for water each day. She gathers three containers for her family of eight to be used for drinking, cooking, bathing, and cleaning. She also needs water to grow her crops.

Dede Aryehteye from Ghana must also travel for water. Water hunger is killing the village where she lives. The village's three ponds and pump stand have dried up due to uncertain rainfall. Scarcity of water holds back her farming also. "With it we can grow every thing here, maize, cassava, vegetables. Without it we are dying."

Cholera Epidemic Claims Lives in Peru

In a four-month period during 1992, over 400,000 people in Peru fell ill with cholera, and more than 3,000 people died from the epidemic. Thousands of people die globally each year from water-borne diseases like cholera, which causes severe diarrhea and dehydration. In communities that do not have access to adequate sanitation, the water supply can easily become contaminated and unsafe for drinking or cooking. Since water is necessary for survival, however, many are forced to drink unsafe water in order to stay alive. While water-borne illnesses are more likely to be fatal among children, many adults become infected repeatedly during their lifetimes. Access to sanitation, safe water, and safe food is necessary to prevent cholera and other water-borne-diseases.

ADVERTISEMENT

Children in some cities are already wearing them—

oxygen masks!!

If we continue to pollute our air, you too can be one of the crowd—wearing a mask of your very own!!

Less Land to Go Around

A village chief in Madagascar scans a valley that he once owned entirely. Now, it has been divided among his 10 children, all of whom must try to feed their own families. With each generation the land is divided as new households form—and less area is available for cultivation. If families want more land, they must cut into the forested hillsides.

One year the families may grow rice; the next, cassava. After that, the land should lie fallow for six or seven years so that the topsoil can regenerate. Because the families must eat, however, they may plant crops that require less fertile soil, or may leave the land fallow for only one or two years. With each year, the soil becomes less and less fertile and cannot yield as much food. Eventually, the land may become barren.

Malnutrition and Infection:

Research Reveals Conspiracy

Each year there are about 13 million deaths among children under age five. Over 8 million of these deaths are caused by diarrhea, pneumonia, malaria, and other diseases that could be prevented with vaccination. Using data from 53 developing countries, researchers from Cornell University now conclude that over half of the 13 million child deaths each year are associated with malnutrition. Disease, it seems, does not work alone.

Children who are even mildly malnourished have a greater chance of getting sick, and have a harder time recovering from disease. This combination of malnutrition and infection prevents proper growth and development, and raises the risk of early death. To combat child mortality rates, actions must focus on improving nutrition **and** protecting against disease.

Movie Review: Apollo 13

During the journey of Apollo 13, the astronauts' lives were in danger when the supply of water and fuel became limited, inside temperatures threatened their health, and the concentration of carbon dioxide rose to dangerous levels. A report about their peril explained: "While the astronauts appear to have enough oxygen to keep them alive, one thing they have too much of is carbon dioxide. With each breath, the three men expel more of the poisonous gas into the lunar module cockpit and the scrubbers intended to keep the atmosphere breathable are quickly becoming saturated."

The crisis is an example of how a closed system (the spaceship) with finite resources can become stressed and threaten the lives of its inhabitants. The crisis can be compared to our struggle on Earth to maintain a sustainable living system. The oxygen supply is plentiful, but the level of carbon dioxide emissions is increasing and is likely to threaten the environment. By eliminating one of our most efficient absorbers of carbon dioxide—trees—we will eventually saturate our atmosphere too.

MAPPING HUMAN STRESS

Introduction:

Human well-being and environmental security are issues of concern at all levels of activity, ranging from local to regional to global. Such issues have social, economic, and political implications, especially when some countries are unable to meet the basic needs of their populations. It is often difficult, however, to visualize the scope of the stress created by unmet basic needs, particularly when the indicators of stress are presented in statistical form. In this activity, students working in small groups will use measures of human stress to classify and map data in order to identify patterns and speculate on factors contributing to different types of stress facing people around the world.

Grade Level: 6-12

Time Required: One to two class periods

Standards Addressed:

Geography standards

1. *Knows and understands how to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.*

Science standards

F, grades 5-8 *Populations, Resources, and Environments*

F, grades 9-12 *Population growth, Natural resources, Environmental quality,* and *Science and Technology in local, national, and global challenges*

Skills:

This learning activity requires students to:

- ask geographic questions
- acquire geographic information
- organize geographic information
- analyze geographic information
- answer geographic questions

Vocabulary/Concepts: basic needs, per capita water availability, per capita cropland availability, malnutrition, access to safe water, access to adequate sanitation, child mortality

Objectives:

As a result of completing this learning activity, students will:

- identify measures of water, food, and health stress.
- apply measures of stress to classify data.
- map countries experiencing stress.
- speculate on factors contributing to stress.
- compare countries experiencing stress and the United States.

Materials:

(You will need supplies for seven groups)

- Paper copies of blank world maps (enlarge to 11" x 17" if possible)
- Transparencies of blank world maps
- *World Population and the Environment Data Sheets*, including glossary of terms
- Colored pencils
- Atlases

The Learning Activity:

Background:

Data from the *World Population and the Environment Data Sheet* can be used to assess levels of human stress in selected world countries. Continuing from Lesson 1, "What Humans Need," indicators of water stress, food stress, and health stress can be used to create a global picture of human needs stress. Students will discover that maps are especially effective tools for "seeing the big picture," since they enable us to observe patterns that are difficult to discern in columns of data in a statistical table.

MAPPING HUMAN STRESS *continued*

Introducing the Activity:

Ask students how they might identify those countries experiencing human needs stress. Discuss some of the difficulties in using tabular data for making comparisons. Ask students how they might use maps to simplify large data sets. Point out the advantages of maps in presenting patterns in data.

Executing the Activity:

1. Divide the class into seven groups, assigning each group one of the following categories:

   a. Per Capita Water Availability (cubic meters) 1990 and Per Capita Cropland Availability (hectares) 1990 .
   b. Per Capita Water Availability (cubic meters) 2025
   c. Population with Access to Safe Water (percent)
   d. Population with Access to Adequate Sanitation (percent)
   e. Child Mortality Rate (under age 5)
   f. Children Suffering from Moderate or Severe Underweight (percent)
   g. Per Capita Cropland Availability (hectares) 2025

   NOTE: The first group is required to produce two maps.

2. Distribute a copy of the *World Population and the Environment Data Sheet*, including a copy of the glossary of terms, a blank world map (or two), colored pencils, and an atlas to each group. (See "Extensions and Variations" for recommendations about overhead transparencies.)

3. Have each group read the description of their category in the data sheet definitions in the glossary section of this classroom guide. Then have each group identify those countries experiencing stress in its assigned category, based on the information provided in the glossary. (Students mapping water and cropland availability should use the stress indicators. Those students mapping access to safe water should map the countries with 50 percent or less; sanitation, 40 percent or lower; child mortality rate, 125 or higher; and underweight, 35 percent or higher.)

4. When countries experiencing stress have been identified, have students use the atlas to locate these countries. Then they should shade and label each country on the blank map. Maps should include title (with date) and source.

5. When all maps are complete, post them on a bulletin board or on the chalk board so that the class can observe the patterns revealed.

Concluding the Activity:

Invite students to speculate on factors that might account for the patterns of stress presented in their maps (e.g., climate, poverty, population pressure, political instability, etc.).

Ask students where the United States fits into the picture presented in the maps. Note that the United States is conspicuously absent. Have various students refer to the *World Population and the Environment Data Sheet* to determine the level of the United States in each category. How do they account for the absence of human needs stress in the United States?

Point out that the data table presents only national averages. Ask whether there may in fact be "pockets" of stress, even in the United States. And conversely, does *everyone* in the countries shaded on the maps suffer from human needs stress?

MAPPING HUMAN STRESS *continued*

Extensions & Variations:

1. Transparencies could be used in addition to or instead of paper maps. If students color the transparencies they can be overlaid to show differences. However, the paper maps can be posted on the wall and used for reference during the unit. I would use both. Simply have each group do a color map and a color transparency.
2. Have students read local newspapers or use other sources to identify pockets of stress in their state or community.
3. Students could also map population variables such as population density or rate of natural increase to assess the correlation between population distribution and change and stress.
4. Discuss or research the factors that cause or contribute to stress locally and in other areas.
5. Older students could examine data categories available in the U.S. census for their state, and then develop a set of indicators for measuring patterns of stress among the counties of the state. Working in groups, the students could repeat the steps of this learning activity to examine and analyze patterns within the local state.

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LESSON 3

SHOPPING AT THE GLOBAL RESOURCE BANK

Introduction:

As people around the world work to meet their basic needs and improve their lives, they make choices that have an impact on the environment. These impacts vary, depending on peoples' activities, their standards of living, and the types of goods and services to which they have access. In Part 1 of this activity, students participate in a simulation to develop an image of how people's options for meeting their needs vary depending on personal buying power. They will also consider how people's actions may modify the physical environment and how such modifications may affect the ability of people to meet their basic needs. In Part 2, students analyze maps to identify connections among wealth, quality of life, carbon dioxide emissions, and changes to the local and global environment.

Grade Level:

Part 1: 3-12; adaptable to lower grades
Part 2: 9-12

Time Required:

Part 1: One class period
Part 2: One class period

Standards Addressed:

Geography standards

14.	*Knows and understands how human actions modify the physical environment.*
16.	*Knows and understands the changes that occur in the meaning, use, distribution, and importance of resources.*

Science standards

F, grades 5-8	*Populations, resources, and environments*
C, grades 9-12	*Interdependence of organisms*
F, grades 9-12	*Natural resources, Environmental quality,* and *Science and technology in local, national, and global challenges*

Skills:

This learning activity requires students to:
- ask geographic questions
- acquire geographic information
- organize geographic information
- analyze geographic information
- answer geographic questions

Vocabulary/Concepts:

GNP per capita adjusted for purchasing power, carbon dioxide, emissions (total and per capita), greenhouse effect, climate change

Objectives:

As a result of completing this learning activity, students will:
- consider connections between wealth and quality of life.
- identify factors that drive changes in consumption patterns.
- discuss the environmental impacts of a variety of human actions.
- explain how consumption patterns affect global systems.

Materials:

- Copies of handout: "Human Needs Credits" (enough for each student to have one "credit card")
- Blank index cards
- Global Stress maps from Lesson 2
- Human Needs Continuum from Lesson 1
- Transparency of Chart 1, "Global Resource Bank: Menu"
- Transparency of Map 1, "GNP Per Capita (PPP$) 1994: Top 20 Countries"
- Transparency of Map 2, "Per Capita Carbon Dioxide Emissions 1992: Top 20 Countries"
- Transparency of Map 3, "Total Carbon Dioxide Emissions 1992: Top 20 Countries"

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SHOPPING AT THE GLOBAL RESOURCE BANK *continued*

The Learning Activity:

Background:

Humans and other organisms use the environment in three ways:

1) As a **resource bank**. The environment supplies the raw materials needed to maintain existence. This includes the consumption of food, water, energy, territory, and the materials to build shelter. Humans also need resources and energy to maintain social and technological structures.

2) As a **habitat**. Humans require more space per individual than any other species.

3) As a **sink for wastes**. Wastes include things such as excreta, dead tissue, trash, and molehills. Humans leave more waste than other species.

The absolute number of people and the technology they employ to access resources, economic growth, and political and economic systems all play a role in the demand for resources, the level of goods and wastes produced, the consumption levels of people all over the world, and the access people have to resources. (See *World Population and the Environment Data Sheet* for an in-depth explanation.)

Environmental degradation in many developing countries is the result of poor people struggling to acquire basic essentials—food, water, and fuel. In addition, the poor often must contend with unhealthy environments because of inadequate sanitation, housing, water supply, and waste disposal. On the other end of the spectrum, actions to improve the quality of life in the United States and other more developed countries also place stress on the environment. Environmental damage resulting from the actions of people in all countries can be both local and global in its consequences. However, the more developed countries contribute most to global environmental problems.

One of the results of the current standard of living in industrialized nations is the increased level of CO_2 emissions due to the burning of fossil fuels. Over the last hundred years or so, the amount of CO_2 in the atmosphere has increased from about **285** ppmv (parts/million by volume) in the early 19th century to more than **350** ppmv today. Scientists are concerned that the amount of this heat-absorbing gas in the atmosphere, along with other greenhouse gases, will result in changes in the Earth's heat balance, leading to global climate change. While the bulk of greenhouse gas emissions comes from the United States and other industrialized countries, the consequences of climate change would have a global impact.

Preparing for the Activity:

Make copies of the handout "Human Needs Credits." Cut the "credits" apart. You will need one credit card for each student in the class. Fold each credit card so that the value does not show. Place all of the credit cards in a basket or box and mix them. Each student will draw a credit card during the lesson.

Introducing the Activity:

1. Ask students to review the Global Stress maps from Lesson 2.

- Which countries appear three or more times?
  (Afghanistan, Angola, Bangladesh, Burkina Faso, Cambodia, Egypt, Ethiopia, Ghana, Guinea, Haiti, India, Israel, Kenya, Madagascar, Mali, Mozambique, Myanmar, Nepal, Niger, Nigeria, Pakistan, Rwanda, Saudi Arabia, South Korea, Tanzania, Uganda, Vietnam, Yemen, Zaire)
  (Write each country on an index card.)
- Why is the United States not on any of the maps?
  (Write "United States" on an index card.)
- Which country appears more often than any other?
  (Add a ✲ to Haiti's card.)

2. Review the concept of the Human Needs Continuum from Lesson 1. Ask students to decide where along the continuum each of the countries listed on the index cards should appear and place the cards on the continuum.

3. Ask students what has enabled the United States to move so far up the Continuum, while Haiti remains at the lowest end. Discuss the different levels of wealth in these countries. Ask students to find the GNP/Capita indicator in the *World Population and the Environment Data Sheet*. Review the definition and compare the U.S. and Haiti values. How does this impact the ways that people are able to meet their basic needs?

Executing the Activity:

Part 1:

Explain that students will have an opportunity to go shopping at the Global Resource Bank (discuss) to obtain their basic needs. Students first need some form of currency, so pass around the basket of "Human Needs Credits," allowing each student to draw one card.

4. Explain to students that they will participate in a simulation to demonstrate how wealth determines people's abilities to meet their basic needs and to improve their quality of life. Ask students to look at their "credit cards." Tell students that this is the amount of credit that they have to meet their basic food, water, health, energy, and transportation needs. Once they have met these needs they may use any remaining credits to purchase nonessential items.

5. Place Chart 1, "Global Resource Bank: Menu" on the overhead. Inform students that they must make a selection from each of the first four rows of needs. Have students jot down their choices and the value of each. If they have credits remaining, they may make additional choices as long as their credits last.

6. Ask various students to describe what they chose and why. Discuss if/how their choices differed according to their levels of income. Have students speculate where on the Human Needs Continuum they would fall.

7. Ask students to consider the impact of their choices on the environment. Discuss the effect that each of these choices might have on the environment and on their own well-being. Did they consider the impact on the environment before making their choices? In this context, how might their different levels of income affect the environment?

8. Conclude that all human actions affect the environment in one way or another. The consequences may be positive or negative in impact; local or global in nature.

Note to Teacher:

Younger students may end the lesson at this point. Older students will benefit from completing Part 2 of this activity, which progresses to have students analyze real world data and make connections between wealth, consumption, and global environmental issues.

Part 2:

Place Map 1, "GNP Per Capita (PPP):Top 20 Countries" on an overhead.

9. Ask students to identify any country that shows up on both the GNP map and any of the global stress maps. [Japan is one such country (cropland availability).]

   - What is the connection between GNP/Capita and meeting basic needs? (A country either has the resources to meet its basic needs or has enough money to buy what it needs; when basic needs are met, people have more time to pursue other activities.)
   - What is the relationship between GNP/Capita and consumption patterns? (When GNP/Capita increases, people have the money to meet their basic needs and begin to consume more resources.)
   - What is the connection between increased consumption patterns and impact on the environment? (Increased consumption leads to different types of environmental problems, such as waste, air pollution, and the emission of greenhouse gases.)

10. Point out that the impact of environmental problems related to high consumption levels is different from that experienced in a country like Haiti. For example, generation of greenhouse gas emissions such as carbon dioxide, which results from the burning of fossil fuels and deforestation, can lead to global stress.

11. Place Map 2, "Per Capita Carbon Dioxide Emissions: Top 20 Countries" on an overhead.

    - Ask students to assess the relationship between levels of CO_2 emissions and basic needs stress (i.e., Do countries under stress to meet basic needs contribute a lot to CO_2 emissions?).
    - Ask students to assess the relationship between levels of CO_2 emissions and GNP/Capita (i.e., Do countries with high GNP/Capita contribute a lot to CO_2 emissions?).
    - Ask students if the CO_2 map shows which countries emit the most CO_2 (i.e., total volume).

      (Note: This map shows per capita CO_2 emissions, not the <u>total</u> volume of CO_2 for each country.)

    - Ask students to guess which countries emit the most CO_2.

12. Place Map 3, "Total Carbon Dioxide Emissions: Top 20 Countries" on the overhead. Have students compare this map to the per capita emissions map. Discuss the differences. Why are China and India in the top 20 in total emissions, but in not per capita emissions? (because of absolute population size).

SHOPPING AT THE GLOBAL RESOURCE BANK *continued*

Concluding the Activity:

13. Ask students to consider some of the consequences for the environment and for people of a build-up of CO_2 in the Earth's atmosphere.

    Introduce the concepts of "greenhouse effect" and "climate change" and have students discuss the relationship between these examples of environmental impact and CO_2 emissions.

    Be sure that students recognize the connection between local choices and global consequences.

Extensions & Variations:

1. In Part 1, have students work in small groups to make decisions about obtaining their basic needs.

2. In Part 1, for younger students, use pictures with the words on the Global Resource Bank Menu and use paper money instead of credits.

3. To aid students in consolidating the concepts and connections introduced in Lessons 1-3, two case studies are provided. Each case study builds on different aspects of the core material already explored. Therefore, ideally, students should experience both. However, if time does not permit, you should select one of the case studies before moving to the culminating activity.

   Case Study 1: The Price of Failed Stewardship: A Profile of Haiti

   Case Study 2: A Matter of Accountability: Industrial Countries on Trial

HUMAN NEEDS 2 credits	HUMAN NEEDS 10 credits	HUMAN NEEDS 25 credits
HUMAN NEEDS 2 credits	HUMAN NEEDS 10 credits	HUMAN NEEDS 25 credits
HUMAN NEEDS 2 credits	HUMAN NEEDS 10 credits	HUMAN NEEDS 25 credits
HUMAN NEEDS 2 credits	HUMAN NEEDS 10 credits	HUMAN NEEDS 25 credits
HUMAN NEEDS 2 credits	HUMAN NEEDS 10 credits	HUMAN NEEDS 25 credits

LESSON 3, CHART 1

GLOBAL RESOURCE BANK

Menu

FOOD	Largely vegetarian diet, mostly home grown or from local sources (1 credit)	Vegetarian diet with occasional meat from local sources (2 credits)	Varied diet w/foods from distant places (e.g., oranges in winter) (6 credits)	
WATER	Transport in buckets from river (no monetary cost)	Untreated well water (1 credit)	Treated water (3 credits)	Indoor plumbing w/hot water (5 credits)
ENERGY	Fuelwood from nearby forest (no monetary cost)	Coal (2 credits)	Oil (3 credits)	Solar energy (8 credits)
TRANSPORTATION	Walking (no monetary cost)	Public transportation (1 credit)	Motorcycle (2 credits)	Car (10 credits)
LUXURY	Radio (1 credit)	Television (3 credits)	Refrigerator (4 credits)	Air conditioning (10 credits)

GNP PER CAPITA (PPP) 1994: TOP 20 COUNTRIES

Source: World Bank, *The World Bank Atlas, 1996*

LESSON 3, MAP 2

PER CAPITA CARBON DIOXIDE EMISSIONS 1992: TOP 20 COUNTRIES

Source: World Resources Institute

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LESSON 3, MAP 3

TOTAL CARBON DIOXIDE EMISSIONS 1992: TOP 20 COUNTRIES

Source: World Resources Institute

CASE STUDY 1

THE PRICE OF FAILED STEWARDSHIP

Introduction:

The human face of environmental stress is often lost in the maze of numbers and statistics used to describe development. In the real world, human needs and environmental stress are problems confronted by real people in real places. In this jigsaw activity, students will read accounts of people dealing with the daily struggle of survival in Haiti, a small Caribbean country only two hours away from the United States by airplane. Drawing on a variety of resources, they will develop a profile of Haiti and assess the ways in which basic human needs are being met.

Grade Level: 8-12

Time Required: One to two class periods

Standards Addressed:

Geography standards

14.	*Knows and understands how human actions modify the physical environment*

Science standards

F, grades 5-8	*Populations, resources, and environments* and *Science and technology in society*
F, grades 9-12	*Natural resources, Environmental quality*, and *Science and technology in local, national, and global challenges*

Skills:

This learning activity requires students to:
- ask geographic questions
- acquire geographic information
- organize geographic information
- analyze geographic information
- answer geographic questions

Vocabulary/Concepts: basic needs, foreign assistance, nongovernmental agency (NGO), United Nations Development Programme (UNDP), United States Agency for International Development (USAID)

Objectives:

As a result of completing this learning activity, students will:
- relate basic needs concepts to a case study.
- develop a basic needs profile of a country.
- work collaboratively to analyze problems of meeting basic human needs.
- identify sources of assistance in addressing human needs.
- consider shared responsibility for meeting human needs.

Materials:

- Copies of readings on Haiti:
  "Real Lives: Haiti"
  "The Women Water Masters of Haiti"
  "What Hope for Haiti"
  "In Haiti, Reforestation..."
- Copies of Handout 1, "Basic Needs Profile of Haiti"
- *World Population and the Environment Data Sheet*
- Almanacs
- Copies of Handout 2, "Foreign Assistance in Haiti"

The Learning Activity:

Background:

Haiti is among the world's poorest countries. Its poverty is both a result and cause of the environmental degradation that has left the Haitian people unable to meet their basic human needs. Haiti is a prime example of the consequences of failed environmental stewardship, and as such may be a harbinger of the future of other countries that fail to care for the environment as they attempt to meet the needs of their people.

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As is pointed out in "What Hope for Haiti," solutions ultimately must lie within the Haitian people. But at the same time, Haiti must also be helped from outside. The international community must accept some responsibility for the welfare of all people not only for humanitarian reasons, but also because at least some of the environmental problems facing countries such as Haiti are the result of resource exploitation that has fueled development in the industrial countries. Foreign assistance takes many different forms, (1) country-to-country unilateral aid, (2) multilateral aid channeled through international development agencies like the United Nations and (3) programs sponsored by various nongovernmental organizations (NGOs). No single agency is likely to be able to meet such needs alone; it takes the combined efforts of many groups.

Foreign assistance benefits those who receive it as well as the countries who provide it. Aid money often circulates throughout the global economy as goods and services are purchased to bring assistance to the target country. Furthermore, helping people meet their basic needs means that these people are less likely to become economic or ecological refugees fleeing to other countries.

Preparing for the Activity:

Divide the class into four groups. **As homework**, assign each group one of the four readings on Haiti. Each member of the group will need a copy of the group's assigned article. Have students read their article, marking or highlighting indicators of unmet human needs or of environmental stress.

Introducing the Activity:

Call students' attention to the eight maps posted from Lesson 2, "Mapping Human Stress." Point out the frequency with which Haiti appears on these maps. Ask students if this is what they would expect, based on the homework readings.

Executing the Activity:

1. Divide the class into groups, making sure that each reading is represented by at least one student. Provide each group with a copy of the chart, "Basic Needs Profile of Haiti"; *World Population and the Environment Data Sheets*; and an almanac. (The only variable not included in the readings or data sheet is the literacy rate. If an almanac is not readily available, the teacher should provide students with the literacy rate, which is 53 percent.)
2. Instruct each group to draw on information from the *World Population and the Environment Data Sheet*, the almanac, and the articles they have read to complete a profile of Haiti's basic needs.
3. When the profiles have been completed, ask students how they think Haiti measures up against countries such as the United States. If time permits, have students review the definitions of the various indicators on the profile to determine global benchmarks that have been set by various groups, e.g., by 2000, child mortality should be no higher than 70/1000.
4. Now provide each group with a copy of the chart, "Foreign Assistance in Haiti." Direct students to use the articles read for homework to complete the chart, identifying examples of unmet human needs and environmental stress, aid projects, and sources of aid. In the final column, students should indicate who is/should be responsible for the problems facing Haiti.

Concluding the Activity:

On the chalkboard write the heading "responsibility." In separate columns, write the words "individual," "family," "country," and "international community." Encourage students to expand their thinking beyond Haiti and discuss the many different levels of responsibility for addressing the problems of meeting basic human needs.

Extensions & Variations

1. To allow country comparison, students could make a series of "Basic Needs Profiles," including countries representing a variety of development levels.
2. The format of the activity could be used as the basis to study human needs in a different country for which the teacher has appropriate materials.
3. To incorporate math skills, students could use information in the *World Population and the Environment Data Sheet* and in the data sheet notes to prepare graphs comparing Haiti with other countries and with the global benchmarks for the various indicators of human needs.

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BASIC NEEDS PROFILE OF HAITI

Demographics

Population: _____

Natural Increase (%): _____

Projected Population (2025): _____

Education

Literacy Rate: _____

Economy

GNP per Capita Adjusted for PPP: _____

Health

Children <5 underweight (%): _____

Child Mortality rate (/000): _____

Access to Safe Water (%): _____

Access to Sanitation (%): _____

Environment

Water Availability (/capita), 1990: _____

Water Availability (/capita), 2025: _____

Cropland Availability (/capita), 1990: _____

Cropland Availability (/capita), 2025: _____

Forest Cover (%), 15th Century: _____

Forest Cover (%), 20th Century: _____

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FOREIGN ASSISTANCE IN HAITI

What are the problems?	What is being done?	Who is helping?	Who is responsible?

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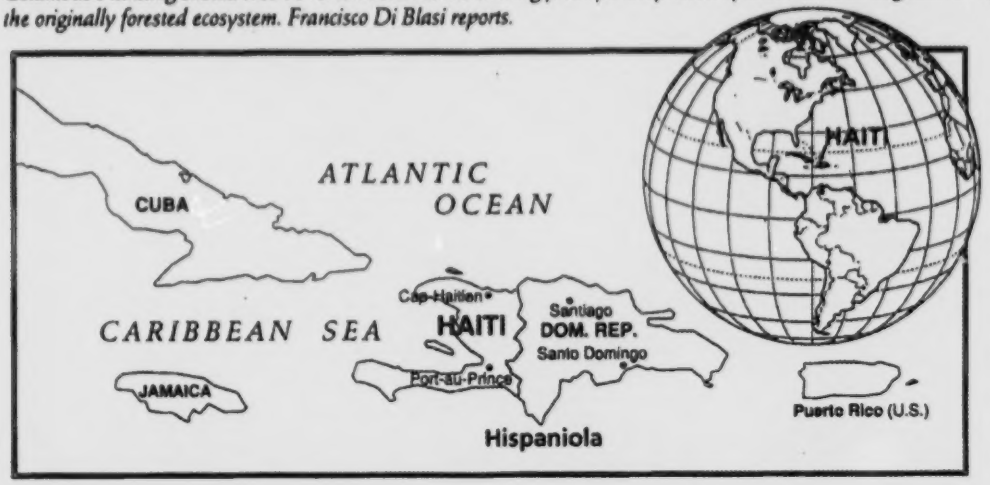
WHAT HOPE FOR HAITI?

Reading 1 *December 6th, 1992 marks the 500th anniversary of Christopher Columbus's landing on an island he named Hispaniola. Its indigenous inhabitants, no more than 300,000 at the time, called it Haiti—the mountainous land. Columbus's landing should also be remembered as the starting point for the process of environmental degradation of the originally forested ecosystem. Francisco Di Blasi reports.*



Until the Conquest, the natives of Hispaniola lived in harmony with their environment. Since their cultivation patterns were oriented to meet sustenance needs they did not exhaust the soil. But as European domination became established, cultivation became specialized and exploitative of both natural and human resources. Disease and malnutrition, added to the hardship of forced labour, drove the natives to virtual extinction and paved the way for the importation of African slaves.

When the French took the western third of Hispaniola, they carved out Saint-Domingue, a true gem among all the colonies in the world. By 1789, the colony accounted for one-third of France's foreign trade and produced one-third of all the sugar consumed in what was considered the civilized world. The seeds of freedom planted during the Age of Enlightenment produced the French Revolution and also inspired the revolt of 500,000 blacks and 30,000 freemen of colour against 28,000 French colonials in Haiti.

In 1804, Haiti (from the Amerindian *Ayiti*, meaning 'land of high mountains'), the first nation of self-liberated slaves in the history of mankind, was born. There is no doubt that Haiti's complex contemporary developmental and environmental issues are unique and deeply rooted in its past. Its problems can hardly be blamed on the majority of its 6.4 million inhabitants. But, as a well-known politician admits, the few privileged Haitians who have dominated politics since 1804 have not been taking care of the country at all.

Since the fall of Baby Doc Duvalier in February 1986, Haiti has acquired a new profile in the international media. Most recently, world attention has focused on its abject poverty, the boat people, deforestation, total environmental degradation, civil liberty abuses, and the struggle for democracy, all of which exist in this small country less than two hours away from the United States.

Some of the issues have been presented as if they were the sole reason for the emigration of Haitians not only to the United States, Canada, and France, but to all the other islands of the Caribbean basin as well. In reality, net population growth, despite death, hunger, and disease, is a built-in factor, although not the origin of all those problems.

Magaly Caram, the executive director of PROFAMILIA Dominicana, views the issues affecting the quality of life in Haiti as similar to those of the Dominican population. Furthermore, the 13.9 million people who share this insular ecosystem of 76,000 km² and their problems cannot be kept totally separated with a political

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frontier. The plight of Haitian migrant workers in the Dominican sugar cane plantations speaks of both the porous borders, and are related to quality of life in both countries.

Serge Pintro, Caram's counterpart in Haiti, is the executive director of the Haitian Family Planning Association (PROFAMIL) and also sees the similarities but is very concerned about the advanced degree of deterioration in the quality of life in Haiti. He looks at the degradation of the urban environment in Port-au-Prince, directly caused by the destruction of the rural environment, as a sort of cascade effect that ultimately will affect the whole country.

Since more than one-third of Haiti's territory has become totally unfit for human survival, the ensuing process of urban migration has created several urban nightmares. Cité Soleil, on the Bay of Port-au-Prince, is one of the worst slum areas in the world. Deemed Haiti's own Calcutta, the borough already has an extremely high population density of 25,000 people/km^2. The physical site of the slum is in itself an ecologically irreversible area. Its soil, which is virtually unable to support any vegetation due to the infiltration of sea water, is a symbol of one of the most serious impending disasters in Haiti. The management of the borough's human waste, the provision of water, and overall public health conditions confirm a quality of life that is below any standards of human dignity.

Helena Pierre is a sugar merchant and long-time resident of Cité Soleil. Her business grosses no more than $40 a month. She is also a grandmother and head of a household and must take care of the orphans left behind by her daughter, who died of pregnancy-related causes. She speaks of charcoal, water, sugar, and the health of her daughter as central to her life experience. Obviously, she has the entrepreneurship it takes to survive but she does not have any chance for the empowerment needed to provide a better future for her and her grandchildren. The lack of family planning deprived her daughter of any future at all.

But, whose fault is it anyway? Who must assume the responsibility and the leadership to solve Haiti's inextricably linked population, developmental, and environmental problems? Is there any hope?

The answers to all those questions are anywhere we can find traces of Haiti's mahogany and its people. The environmental degradation of Haiti was started by the North. The lessons of history should not be ignored. The past must be understood and taken into account in the design and implementation of the solutions for the future. Haiti must be unequivocally helped from the outside.

The environmental degradation of Haiti was started by the North.

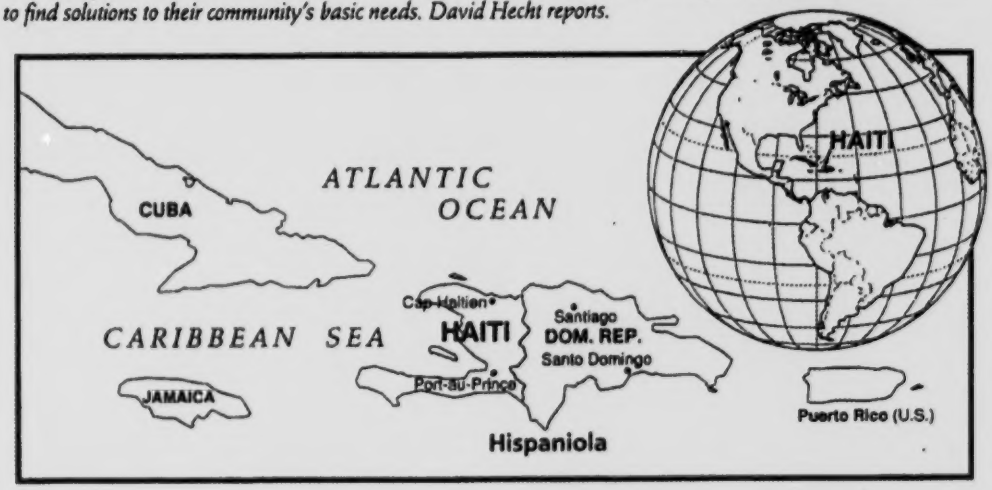
The Haitians also must realize that the key to their survival is within themselves, not in those who will provide the funding. The problems are not partisan issues but the solutions must be worked out in the sociopolitical reality of the country. Haiti has to undergo a national change of attitude so that everyone assumes responsibility. At the individual level, each child must be a wanted child; at the collective level, society must think only in terms of sustainable development with a sense of urgency second to no other consideration.

The international community has its own share of responsibility in supporting the process, if not out of a sense of justice and reparation, at least as a recognition that a vast majority of the Haitians, ultimately ecological migrants, will have to leave their environment once it has become irreversibly unable to sustain human life.

This article was condensed from People & The Planet *Vol. 1, No. 4 (1992). Francisco Di Blasi is senior programme adviser in the IPPF Western Hemisphere Regional Office, New York.*

THE WOMEN WATER MASTERS OF HAITI

Reading 2 *In a tense political climate and complex social structure, women leaders helped negotiate water rights and continue to find solutions to their community's basic needs. David Hecht reports.*



Of all the voodoo gods in Haiti—Catholic saints blended with Africa's Yoruba and Fon spirits and Congo cosmology—Met'dlo received the most praise when potable water flowed into Chantel recently for the first time. The Protestants of the village say they only praise the grace of God Almighty. But the peasants, who are of all religious persuasions, worked together to dig the trenches and lay the pipes from a natural spring over a mile away.

"Now we no longer have to walk for hours every day with buckets of water on our head," says Mrs. George, standing with other women leaders near the shiny new water fountain at the intersection of three dirt roads, which forms the hub of her village. "We women are the ones that do the cooking, the washing and the cleaning," she adds, "and having water close by is a big help." With the extra time for farming, yields of Congo peas, bananas, and sweet potatoes have noticeably increased.

The new fountain is just one small part of a water rehabilitation programme for the valley designed and executed by the development wing of the Albert Schweitzer Missionary Hospital. The project was funded by the United Nations Development Programme (UNDP) and undertaken in the tumultuous period after the ousting of President Aristide by the military in 1991. UNDP was able to support the project despite a United Nations embargo because it fell under "humanitarian" rather than "development" assistance, and because it was implemented by various nongovernmental organizations (NGOs).

But water may never have flowed to Chantel if it were not for local women leaders. The project was designed to rehabilitate existing water lines, which Chantel never had to begin with. However, the women convinced the Schweitzer mission that it should also extend a new line to them, since in neighboring villages the work included rebuilding lines from scratch. "It was only fair," says Mona Charles, one of Mrs. George's fellow co-workers. "And we were prepared to do whatever it took to get it done."

What was needed was manual labor, for which the mission was unable to pay. The women organized work details and ensured that everyone in their village did their share. They also carried out the delicate task of forging a consensus on issues such as where the fountain was to be located. Eric Cole, director of the water division at the mission, says his colleagues were amazed when the work was finished ahead of schedule. "From sun-up to sundown, they were all out there," he says.

It did not happen easily. Extensive negotiation and compromise among various groups had to occur first. "The Lakous [basic social units composed largely of extend families] like to argue about things," says Mrs. Charles. The women

THE WOMEN WATER MASTERS OF HAITI *continued*

not only had to deal with this internal friction, they had to take care not to infringe on the authority of local leaders, particularly the *chefs de sections* (local district officers).

The programme began in 1991, when a nutrition project for infants was started. The mission asked villagers to elect women from the community who they thought could best track the health of the children. The women were trained to study market prices and recommend to the village the best foodstuffs to buy in relation to nutritional value. Since then their roles have expanded. They collect data on disease in their villages, register births and deaths, and recently took part in a literacy programme.

According to the mission, overall health and nutrition levels for the 185,000 people in the valley have stabilized or even improved in some areas, despite the increased stresses of political violence and the UN embargo. However, for Cole, their importance is as liaisons. "The women know what the problems are in their villages and they know how to explain them to all sides," he says.

Quite frequently, what the problems boil down to is water. Sonia Dieutel tells how the incidence of water-borne maladies such as typhoid, and diarrheal diseases caused by giardia and other parasites, have increased in her area. "When we were children the water was safer and we rarely had these sicknesses. Now, they kill us far more frequently..."

Juan Salazar, a UNDP officer in charge of the programme in Haiti, says that providing assistance under Haiti's successive governments has certainly had its problems, but that there is also "a downside" to funding NGOs. "We have had to be very careful with whom we deal," he says, explaining that such groups have occasionally been fronts for various political or other factions But he adds that Haiti has an extraordinarily large number of NGOs, and that, "overall, they are a key development resource."

With the return of President Aristide and a legitimate government, the policy of UNDP and the Haitian government is to "diversify cooperation." Says Salazar, "Our idea is to involve more and more actors—local governments and local leaders, the private sector, NGOs—in general, all of civil society."

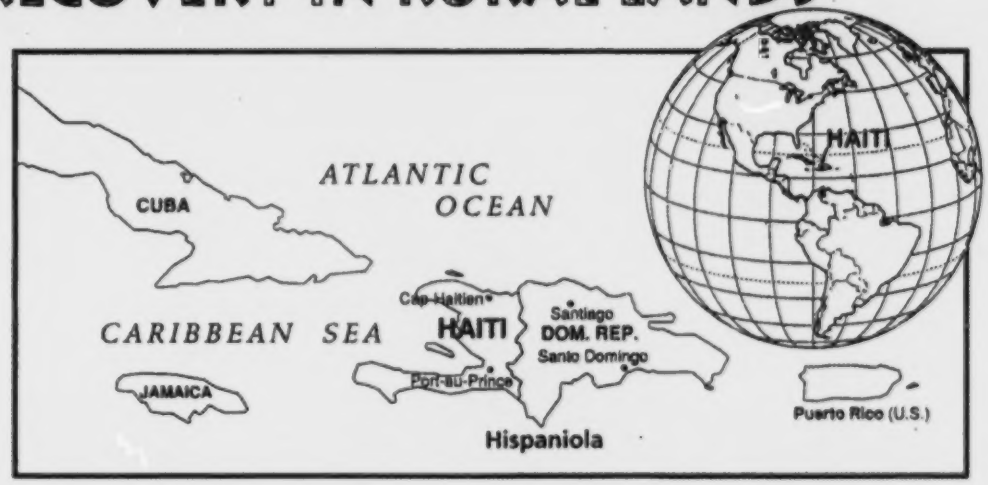
"When we were children the water was safer and we rarely had these sicknesses. Now, they kill us far more frequently..."

Before this latest project, the Albert Schweitzer mission had never received any multilateral funding. The amount from UNDP totaled only US$34,000, but this was enough to rehabilitate two gravity spring systems, extend new lines to several villages, and rehabilitate over 75 of the wells in the 1,500 km² valley. Now a further $200,000 has been requested for a project that will include building reservoirs at the natural springs of Coquillot and Deslandes as well as several irrigation systems.

This article was condensed from CHOICES *(August 1995).* CHOICES *is published by the United Nations Development Programme.*

IN HAITI, REFORESTATION IS KEY TO RECOVERY IN RURAL LANDS

Reading 3



A 30-acre swatch of old-growth trees, cloistered in the middle of one of the city's biggest slums, has become a symbol of Haiti's budding conservation movement and its seemingly overwhelming challenges. Amid the forest are the ruins of a historic estate and luxury resort first built in the early 19th century. Once an opulent paradise for the very wealthy, it is now a gathering place for residents of the nearby slums.

For 50 years, Habitacion LeClerc has been the residence of the renowned Haitian dancer and anthropologist Katherine Dunham. She is determined to make its botanical garden and surrounding forest another of her legacies. But, the property has recently caught the attention of commercial developers keen on rebuilding the resort into a lucrative hotel, says Cameron Brohman, a Canadian anthropologist who is working to preserve the enclave as Haiti's first botanical garden.

That would be harmful, not only for the forest, but for nearby residents who rely on an artesian spring underneath it for water, he says. It's a scenario that has been repeated all too often in Haiti, where forests cover only 3 percent of the land, compared with 80 percent when Columbus visited here in the late 15th century.

"If the forest is cut down, that spring will go back down, will descend into the earth," says Mr. Brohman. "Haiti has a water problem because it has a deforestation problem. So, an ecological disaster begins with the cutting of trees, especially in a country like this, which is mountainous. Cut the trees, the topsoil washes away. This has disastrous economic effects."

The effects of deforestation here, especially on agriculture, have been severe. Nevertheless, while President Jean-Betrand Aristide's latest reforestation initiatives have been slowed by economic concerns, fuel shortages and political infighting, Haiti's growing conservation movement makes small steps of progress. It has been a slow process. One reason, the president says, is that environmental protection and agricultural development are inseparable in Haiti.

"Haiti has a water problem because it has a deforestation problem."

"If we don't develop our agriculture, how can we protect our ecology?" President Aristide said during a recent interview at the National Palace in Port-au-Prince. "Because otherwise, people will not be motivated to plant trees. And we have to plant trees... Nobody, if that person has good sense, can be against this move."

Fuel shortages caused by the international trade embargo against the military regime that ousted Aristide in 1991 intensified an already vigorous Haitian tradition of cutting

IN HAITI, REFORESTATION IS KEY TO RECOVERY IN RURAL LANDS *continued*

down trees for charcoal. For many Haitians, especially those in rural areas without electricity, charcoal has been the cooking fuel of choice for decades.

"During the embargo we saw trees with fruits being cut down, because the farmers did not have a market or the means to transport their product to a local market," says mango exporter Jean Buteau. As unpicked fruit rotted on the branches, fruit trees became attractive as fuel trees. To stop the cutting, Mr. Buteau got permission under the embargo's humanitarian provisions to keep exporting mangoes, and he helped set up a transport network to pick up fruit from farmers, often in remote areas.

"...young people don't even know what a forest is because there are so few now."

But as the embargo wore on, Buteau was forced to close down his processing plant, which is located near the Port-au-Prince airport, and he had to turn away fruit growers. "They came to the plant and they asked, 'What is going to happen to the fruit?' It was very difficult to tell them we just cannot take it," he says.

The links between farming and trees are the basis for the biggest reforestation project in Haiti, led by the U.S. Agency for International Development, CARE, and the Pan American Development Foundation. Under the project, millions of mango, citrus, and avocado trees have been planted to give farmers a new source of income, increase local food production, as well as to expand tree cover. The strategy includes planting large numbers of fast-growing indigenous trees that can be used for lumber and posts.

The project "intensifies land use on a portion of people's land, so that they don't have to use it all for agriculture and so they leave some of it for trees," says Andy White, a Haitian-based forestry expert for the World Bank.

International agencies came to the realization several years ago that reforestation efforts in Haiti would be futile unless, at the same time, they removed the financial incentive to cut down trees for fuel. And now, an economic windfall has helped to promote the project. Kerosene has recently become cheaper than charcoal in Haiti, which should spare more trees from the hands of rural residents.

But because the Haitian landscape is now almost entirely carved into farms of myriad shapes and sizes, it will be an uphill struggle to restore anything but a fraction of the "closed canopy" forest that once covered Haiti. What is possible over the next 50 years is that by planting trees in "degraded forests" that have undergone extensive cutting, 30 percent of Haiti's mountainous terrain could return to forest cover, from the current 3 percent, Mr. White says.

In addition to the economic realities, reforestation in Haiti must be also carried out on the slippery slope of Haitian politics. Parliamentary debate over a new budget has delayed funding for Haiti's environment and agriculture ministries. Many lawmakers oppose conditions placed on the 40 percent of the budget that comes from foreign leaders—including the United States government, the World Bank, and the International Monetary Fund—who insist that Haiti privatize its state-owned industries.

A fluid political situation could further bog down reforestation efforts. The new prime minister, Claudette Werleigh, was sworn in earlier this month, replacing Smarck Michel, who resigned after Aristide refused to publicly back privatization plans.

These obstacles are one reason the organizers of another major initiative called Forêt Solidairé, or Solidarity Forest Project, decided to rely on grassroots support and independent funding. The project's goal is to designate and preserve a national forest in each of Haiti's nine provinces. Currently, only three small national forests are in the country.

"What's become clear in the dire circumstances here in Haiti is that multiple efforts on many fronts are needed," says Rev. Tracy Bruce, an Episcopal priest from Cincinnati, who is one of the directors of Solidarity Forest Project.

IN HAITI, REFORESTATION IS KEY TO RECOVERY IN RURAL LANDS *continued*

The project, officially launched in a pine forest ceremony outside Port-au-Prince today, is modeled after a successful reforestation effort in Israel earlier this century, which attracted contributions from millions of Jews living outside Israel. Similarly, Mr. Bruce is hoping to enlist many Haitian émigrés in a sponsor-a-tree program here. It is estimated that as many Haitians reside outside Haiti as within the country.

The Solidarity Forest Project also involves a plan to teach school children about conservation.

"The whole idea of forests is still in the memory of those who are the oldest here in Haiti and they. . . lament that the young people don't even know what a forest is because there are so few now," says Bruce. "So it's almost like reinventing the dream and bringing back the possibility."

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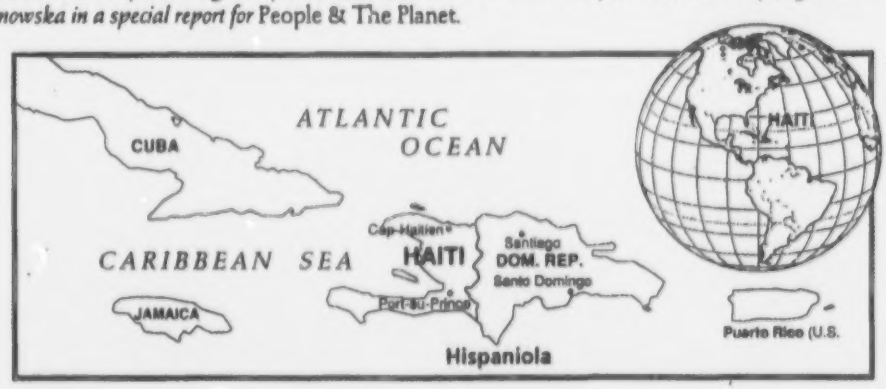
CASE STUDY 1

REAL LIVES: HAITI

Reading 4 *Haiti is an island of environmental refugees. Its once dense forests now cover only 2 percent of the land. With two-thirds of the farmlands sloping more than 20 degrees and a population density of over 270 per km², erosion is severe. Arable land has declined by two-fifths since 1950 and per capita grain production has been halved. Repression and gross maldistribution of land have not helped (4 percent of the farmers own more than half of the land). As a result, more than 1.3 million Haitians—or one in five of the populace—have left their homelands, many for other Caribbean islands, and some 180,00 for the United States or Canada. Others have moved to city slums. The personal stories of these migrants from a devastated land are told here by American anthropologist Catherine Maternowska in a special report for* People & The Planet.



The paths to the river in Ouananminthe, a small village in Haiti's northeastern countryside, are narrow and thick with cactus bush. When she was six years old, Ginette would rise at 5 a.m. with her three older sisters, walk to the river and fill their large oval calabash gourds, perfectly balanced over their heads. The cool water gathered from "the spring," as it was referred to by locals, was essential to the household for drinking, cooking the day's meal, washing the dishes, and for coveted sponge baths.

During the dry season, with the extra hands of her five brothers, they would make several trips a day to the river, filling endless containers with water to moisten the parched earth on her family's land. The water, flushed through the long bamboo tubes, would nourish rows of tiny corn plants.

As Ginette grew older, she learned to prepare the day's meal and serve it to the *conbit*, or large group of planters hired by her parents. For 40 cents a day, men from the village would work the earth from 6 a.m. to 12 noon, racing to plant the grains before the growing season. Planting too late would mean missing the markets.

As she recounts her life—where she grew up and how she came to find herself struggling to survive in a shanty town in Port-au-Prince—her memory is jogged by seasons. "During my fifth mango season," she recounts, "I slipped and broke my arm." The cost of the accident, including paying the bone setter, finding antibiotics, and praying with offerings to ancestors for renewed health, drained the household that year. The next rice season was, as a result, 30 percent less productive. A single sickness can ruin a household's economy in rural Haiti.

"We were skinny and so too was our land."

Desperate for income, with 10 hungry children to feed, Ginette's parents sold the family's cow and pig to buy seed, fertilizer, and a new sickle for the upcoming season. With an aching arm that healed improperly, Ginette would bend over in the fields, machete in hand, clearing the shrubs from the ground. After the corn was planted, the rains failed to come, and an already precarious household plummeted further into poverty. With the sweet potato season on the way, the only recourse was to sell some land and hope the potatoes would grow on the remaining soil.

The year before Ginette was sent to Port-au-Prince, the size of her family's land was halved. "We were skinny and so too was our land." Many of her brothers and sisters had already left for larger, more prosperous villages, hoping to find odd jobs or the chance to go to school. Ginette, it was decided, would go to the capital city. With the smaller plot of land, there was no room for extra hands. The city might lead to work and food.

In Port-au-Prince, Ginette joined her aunt, who lived in Cité Soleil—the densest slum in the Western Hemisphere. Covering 5 km² on the northern edge of capital, it is home to some 300,000 Haitians. It is here where the drama of survival unfolds.

Living conditions are appalling, characterized by small homes made of cardboard packing cases, boards, and abandoned metal sheeting. Inside the homes, walls are decorated with brightly colored pages from *Paris-Match, El Nacional, Sports Illustrated,* and Sears catalogues. Beds are typically raised four cinder blocks high above the ground, since the rain water mixed with sewage gushes thigh-high into homes during the rainy season.

Beds are typically raised four cinder blocks high above the ground, since the rain water mixed with sewage gushes thigh-high into homes during the rainy season.

Unemployment is high, reaching 70 percent in 1993. Residents in Cité Soleil usually try to link into a highly active informal economy. Protected from the sun by plastic tarpaulins, charcoal vendors and women selling imported plastic wares or big pots of goat head stew crowd the tiny passageways of the slum. Profits of US$1 a day are considered generous in a country where 61 percent of the people earn less than US$100 a year.

Water, contaminated rubbish, and fecal matter are the origins of epidemics including malaria, typhoid, chronic diarrhea, and intestinal infections. Infants are especially vulnerable to these diseases, accounting for the deaths of up to one-third of all children before the age of five. It is common to see people washing, bathing, and scrubbing clothes in the filthy canals that twist through the community.

Poor housing, precarious health standards, and intermittent meals decrease the odds of surviving life as an environmental refugee. Yet there is always hope that one child can be sent to school or that another might find temporary income—ensuring the family's survival for another week. Deprived of their land, rural migrants want jobs, food for their families, and a future for their children.

And so it has been for Ginette. She is now 29 years old and has five children. She lives in a minute tin shack on the marshy edges of the Bay of Port-au-Prince. At one time, she sold produce in the markets of Port-au-Prince. She would travel between her city dwelling and her home in Ounaminthe filling large baskets with fruits and tubers to sell in the city. Dwindling crop production and high transportation costs made the journey increasingly difficult.

Her toothless mother, who recently joined Ginette in Port-au-Prince, says, "the spring where my child would find the water is dry now." Shaking her head, she continued, "It's because there are no trees and so the sun took our river. . . but we had no choice." Choked by poverty, Ginette's mother had cut dozens of trees by the river to make charcoal for cooking fires. In the market, sacks of charcoal replace sacks of potatoes.

Ginette's father died when he was 52 years old, just over the life expectancy for men in Haiti. Before his death, more of the family land was sold to pay for his lingering illness and to buy food for the household. When he died, the last parcel of land was sold to pay for the funeral, a ceremony of great importance in Haiti. Soon after, Ginette's mother moved to Cité Soleil and joined the ranks of Haiti's impoverished, landless peasants.

Celeste, Ginette's neighbor, was born in Les Cayes in southwest Haiti. She too fetched water and helped on the family's land as a young girl. "We were always planting or harvesting our crops—rice, corn, manioc, beans, mangos, and avocados. We worked 24 hours on the hour." She crosses her arms and sighs, "we planted but this does not mean we did not suffer."

Her worn face is sad: "We were always in combat with the water. There is plenty of land in Haiti, but our basins are dry. The plants can't push through the dry earth." When the harvest failed to produce, wood became the only resource. Her father would chop the trees and with her mother would dig deep pits in the sides of Haiti's mountains, slowly treating and burning the wood in preparation for sale. "When the trees are finished," she wonders today, "what will there be?" "More hunger," she responds to herself.

"Long ago, even when there was water, we small peasants never had roads." Without roads, rural women walk for days, carrying goods on their heads to the nearest market town. Peasant families who own a donkey have a slightly less daunting trek over Haiti's steep hills en route to the marketplace. "If there were roads and water in our country," Celeste claims, "our children would not leave the countryside. We could sell our produce, eat well, build schools, and live as a peasant deserves to live."

Celeste left Les Cayes for Port-au-Price when neither crops nor charcoal could provide enough income. She was uneducated and only 17 years old. One year later, she had her first child and has since had seven children. Three of them have died. She constructed her own home in Cité Soleil from metal oil barrels pounded into thin walls.

In the city, Celeste found work as a domestic with a wealthy family. Their home was perched high over the hills of Port-au-Prince. She worked from sunrise to sunset: shopping for meals, cooking, scouring pans, washing clothes, and cleaning the home. Her salary was US$25 per month. In the evening, when she returned to Cité Soleil, there were still more chores to be completed.

With great outrage, she tells me: "When you work the land there is no humiliation. Your body aches, scorched and feverish from the sun but you never feel humiliation. The food and the land belong to us and we have great respect for this." Life in the capital city has left its painful scars on Celeste. "When I worked in the home of the family," she continues, "I worked until my body hurt. I was forced to continue, against nature, without stopping—for pennies! This is humiliation."

Celeste looks at me and says in Haitian creole, *"Chache lave, detwi lavi"*: "Searching for life, destroys the essence of life." Ginette nods in agreement. Neither of these women have improved their status through migration to Port-au-Prince. As they so poignantly express, everything they have learned, accomplished, and believed in has been destroyed. "There's not a cup of water to drink in the countryside—and here, if there is water, our children become sick from it. . .sometimes they die."

"Searching for life, destroys the essence of life."

A reversal of rural to urban migration, a trend that has yielded inferior lives in Cité Soleil, seems to hold little hope. "What will save Haiti," Ginette and Celeste say, "is water and roads. Then our crops could grow again and we could sell produce in every corner of our country."

They smile as they list the things they wish for most in rural Haiti: "Schools for our beautiful children, clinics for the ill, water pipes that descend into the rocks underneath the earth."

"What about trees?" I ask. "Does Haiti need trees?" They slap their knees, laughing. "Heeey! Yes! We need trees and engineers to help us plant them, and roads to bring them to us and water to help them grow."

In April 1986, a national march in favor of reforestation and conservation of natural resources marked the start of concerted efforts to protect Haiti's ecosystem. National and international organizations established themselves; tree planting and water projects took on increased importance. But with the fall of democracy, most notable since President Aristide was ousted in a violent coup, the impetus to protect the environment and empower those who live in it all but died.

Ginette and Celeste would be the first to say that it is the new chance for democracy, not dictatorship, that is the true hope for returning Haiti to the earthly paradise it once was.

This article was condensed from People & The Planet *Vol. 3, No. 4, 1994. Catherine Mateniowska is an anthropologist.*

CASE STUDY 2

A MATTER OF ACCOUNTABILITY

Introduction:

When human actions alter the local environment, it is usually the people responsible who must deal with the consequences. However, when human actions affect global systems, the impact can be far-reaching. In this learning activity, students will prepare and participate in a mock trial to try to assign responsibility for the consequences of climate change resulting from the build up of CO_2 emissions in the Earth's atmosphere.

Grade Level: 8-12

Time Required: One day for the trial; additional time for role preparation

Standards Addressed:

Geography standards

14.	*Knows and understands how human actions modify the physical environment.*
15.	*Knows and understands how physical systems affect human systems.*

Science standards

D, grades 9-12	*Geochemical cycles*
F, grades 5-8	*Personal health; Populations, resources, and environments; Natural hazards; Risks and benefits;* and *Science and technology in society*
F, grades 5-8	*Population growth; Natural resources; Environmental quality; Natural and human-induced hazards;* and *Science and technology in local, national, and global challenges*

Skills:

This learning activity requires students to:
- ask geographic questions
- acquire geographic information
- organize geographic information
- analyze geographic information
- answer geographic questions

Vocabulary/Concepts: climate change, greenhouse effect, sea level rising, carbon dioxide (CO_2)

Objectives:

As a result of completing this learning activity, students will:
- understand some of the contributing factors related to the theory of climate change.
- conduct a mock trial: Bangladesh vs. the industrialized nations.
- formulate and defend an opinion based on analysis of facts from different sources.
- consider the issue of accountability in global environmental change.

Materials:
- Copies of handout 1, "Plaintiff: People of Bangladesh"
- Copies of handout 2, "Defendant: Nations of the Industrialized World"
- Copies of handout 3, "Facts About Bangladesh"
- Copies of handout 4, "Climate Change and Greenhouse Gas Emissions: Fact Sheet"
- Map 1, "Bangladesh: Areas at Risk of Coastal Flooding"
- *World Population and the Environment Data Sheet*

The Learning Activity:

Background:

The United Nations Convention on Climate Change calls for nations to address the potential problem of CO_2 emissions. The Convention also includes a process for nations to settle disputes, including a trial before the International Court of Justice. Faced with the prospect of severe coastal flooding resulting from climate change, many countries, especially poor countries such as Bangladesh, may very well appeal to the international community for assistance in meeting the basic needs of their people in the face of diminished land area.

Using the format of a judicial proceeding requires students to weigh evidence from opposing perspectives to arrive at a decision about accountability. Such a scenario also confronts students with the dilemma of their own quality of life at odds with the humanitarian needs of one of the world's poorest countries.

Suggested background reading:

"Global Atmospheric Issues: The Greenhouse Effect," *The State of the Environment* (OECD, 1991), pp. 20-29.

"Climate Change: A Global Concern," *World Resources 1990-91*, pp. 11-31.

Preparing for the Activity:

1. In Part 2 of Lesson 3, "Shopping at the Global Resource Bank," students identified the build up of CO_2 emissions as an example of a consequence of human consumption patterns that has a global environmental impact.

   Explain to students that over time, the "greenhouse effect" may result in an increase in average global temperatures by 1.5°C to 4.5°C. This would result in a rise in the level of the world's oceans due to the melting of glaciers and polar ice caps. The extent of future climate change is unknown and at this time remains theoretical. Still, the prospect of higher sea levels is cause for great concern in many coastal countries with extensive low-lying land areas. One such country is Bangladesh.

2. Place Map 1, "Bangladesh: Areas at Risk of Coastal Flooding," on an overhead. Have students speculate about the consequences for this small country if projected flooding should occur. Students may want to refer to the global stress maps or the *World Population and the Environment Data Sheet* to determine the current state of well-being in Bangladesh as they consider consequences of coastal flooding.

Introducing the Activity:

3. Announce to students that they are going to conduct a mock trial focusing on the responsibilities of developing and industrialized countries concerning global environmental issues, specifically CO_2 emissions and climate change.

4. Divide the class into 11 small groups and distribute appropriate materials for each group to portray one of the following roles: 1) lawyer for plaintiff; 2) lawyer for defendant; 3) judge; 4) climatologist for the plaintiff; 5) geographer for the plaintiff; 6) agricultural expert for the plaintiff; 7) demographer for the plaintiff; 8) climatologist for the defendant; 9) environmental scientist for the defendant; 10) demographer for the defendant; and 11) United Nations representative for the defendant.

5. Allow time for each group to evaluate the evidence and prepare a statement representing their respective area of interest or expertise. Remind students that they must focus on evidence rather than opinion. Direct students to the following resources to help them with background information:

   a. Climate Change Fact Sheets-INDEX (http://www.unep.ch/iucc/fs-index.html)
   b. Michael D. Lemonick, "A Heading for Apocalypse?" *Time* Vol. 146, No. 14 (New York: Time Inc., October 2, 1995) pp. 54-55.
   c. Charles E. Cobb, Jr., "Bangladesh: When the Water Comes," *National Geographic* Vol. 183, No. 6 (Washington, DC: National Geographic Society, June 1993) pp. 118-134.
   d. Houghton and Woodwell, "Global Climate Change," *Scientific American* Vol. 260, No. 4 (New York: Scientific American, Inc., April 1989) pp. 36-44.

6. Explain that each group should select a person to portray the role, but the groups should develop responses to the questions collectively. Witnesses should be prepared to respond to the questions, while the lawyers should prepare opening and closing statements and be prepared to question their witnesses.

A MATTER OF ACCOUNTABILITY *continued*

Executing the Activity:

7. Set up the classroom for the trial: presiding judge in center front; plaintiff's and defendant's tables on either side; area for expert witnesses; witness stand; etc., as simply or as elaborately as time permits.

   Note: Each student should have note-taking paper available so that important information on both sides of the question can be recorded and used to formulate an opinion.

   a. Lawyers present opening arguments.
   b. Plaintiff's lawyer calls witnesses, and asks each witness the prepared questions. Witnesses (who have prepared for their roles) answer in character, and can use props, maps, etc., to make positions clear.
   c. Defendant's lawyer calls witnesses.
   d. Lawyers present closing arguments, drawing on the information presented by witness from both sides.
   e. Judge thanks lawyers and witnesses and adjourns to deliberate and prepare opinion.

Concluding the Activity:

8. Each student should complete his/her notes during this class discussion time. The teacher should review relevant information and lead a discussion on the judge's freedom in decisionmaking. The decision does not have to be all or nothing, for or against Bangladesh. As an example, the judge could render an opinion that finds in favor of Bangladesh, but directs the industrialized nations to focus attention and money on reducing CO_2 emissions, rather than preparing for the consequences of rising sea levels.

Evaluating the Activity:

Each student should write an opinion. The opinion should state the decision regarding the damages requested by Bangladesh and be supported with facts from the case.

Extensions & Variations:

Allow time for rebuttal.

PLAINTIFF: PEOPLE OF BANGLADESH

Opening Statement

The people of Bangladesh are suing the industrialized nations of the world for potential damages to our country, our people, and our way of life, due to the effects of high rates of carbon dioxide (CO_2) emissions. Carbon dioxide emissions are primarily the result of the burning of fossil fuels, either for transportation or industry. Bangladesh admittedly emits some carbon dioxide into the atmosphere, but the rate is far lower than the rate in industrialized nations. We will hear from the following witnesses:

1. A **climatologist** will discuss the greenhouse effect, climate change, and carbon dioxide emissions.
2. A **geographer** will describe Bangladesh's physical geography and the effects of carbon dioxide emissions.
3. An **agricultural expert** will discuss the impact that climate change will have on agricultural production in Bangladesh.
4. A **demographer** will describe the people of Bangladesh, where they live, and how their lives will be affected by climate change.

CLIMATOLOGIST

Explain the greenhouse effect and what is meant by climate change.

What are the "greenhouse gases?"

What are the major sources of greenhouse gas emissions?

What will happen if carbon dioxide emissions continue?

GEOGRAPHER

Describe the physical geography of Bangladesh.

How might the land and weather patterns be affected by climate change?

AGRICULTURAL EXPERT

Explain the type of agriculture practiced in Bangladesh.

Currently, is Bangladesh able to adequately feed its population?

How would farming and agricultural production be affected by climate change?

DEMOGRAPHER

Describe the population of Bangladesh, its size, and distribution.

How would you describe Bangladesh's current level of well-being?

How would the lives of the people of Bangladesh be affected if predictions of sea-level rising prove to be true?

DEFENDANT: NATIONS OF THE INDUSTRIALIZED WORLD

Opening Statement

The people of the world's industrialized nations are here today to refute the charges brought by the representatives from Bangladesh. While we admit that we are responsible for a portion of the carbon dioxide emissions worldwide, we are not the only responsible parties. China, a developing nation, by virtue of its great population, is responsible for a significant percentage of carbon dioxide emissions, and is not included as a defendant in this suit. Bangladesh itself emits some carbon dioxide into its atmosphere. In addition, carbon dioxide is not the only greenhouse gas that could affect climate change; others, such as methane, are also responsible and are largely the result of nonindustrial processes. These factors alone should be enough to decide in our favor. But they are not the most important piece of the puzzle. While the fact of carbon dioxide and other greenhouse gas emissions cannot be disputed, the effect on Bangladesh is unknown. In addition, some of Bangladesh's problems are due to deforestation in the Himalayan mountains. We will call the following witnesses:

1. A **climatologist** will explain the sources of greenhouse gas emissions and will explain the tentative nature of the charges brought by Bangladesh.
2. An **environmental scientist** will describe the current quality of the environment in Bangladesh and explain the problems caused by deforestation.
3. A **demographer** will discuss increasing population growth in developing countries and the trend of increasing carbon dioxide emissions from these countries.
4. A **representative from the United Nations** will describe the work of the UN "Framework Convention on Climate Change" and the ideas of shared responsibility.

CLIMATOLOGIST

What are the various sources of greenhouse gas emissions, and more importantly, carbon dioxide emissions?

Are industrialized nations the only countries who contribute significant levels of carbon dioxide?

Are scientists in agreement and certain about the effects of continued carbon dioxide emissions on the Earth's climate and on Bangladesh?

ENVIRONMENTAL SCIENTIST

Comment on the quality of Bangladesh's environment.

What activities occur at the local level in Bangladesh, and contribute to environmental stress at the regional level?

DEMOGRAPHER

Describe the current and projected (future) population growth in developing nations.

How will population growth in developing countries contribute to the levels of carbon dioxide and methane emissions? Specifically discuss China and India.

UN REPRESENTATIVE

What is the purpose of the United Nations Framework Convention for Climate Change?

How is this initiative attempting to solve the problems addressed in this suit?

Do international resolutions on climate change target industrialized nations with sole responsibility?

What are the responsibilities of less developed nations?

FACTS ABOUT BANGLADESH

Bangladesh is about the size of Wisconsin.

Apart from city-states such as Hong Kong and Singapore, Bangladesh is the most densely populated country in the world with 832 people per km^2.

In 1996, 40 percent of the population was under age 15.

Life expectancy at birth is 57 years. The literacy rate is 51 percent for men and 74 percent for women.

Forty-five percent of the population has access to health services.

The high population density is made possible largely by the fertile soil, and availability of freshwater for year-round cropping.

Eighty-four percent of the population lives in rural areas and engages in subsistence agricultural activities.

Most of the population relies on fishing and water-intensive agriculture for subsistence.

Bangladesh struggles constantly to produce or import enough food for its rapidly growing population.

An estimated 10 to 15 percent of the population is at serious nutritional risk; the majority faces food insecurity.

Almost all of Bangladesh lies on the largest delta in the world born of the silt carried by three major river systems: the Ganges, the Brahmaputra, and the Meghna.

The intensively farmed, low-lying alluvial plain is frequently subject to flooding, particularly during the peak of the wet monsoon period.

Annual floods can cover as much as 35 percent of the country.

Bangladesh's predominantly agricultural economy depends heavily on an erratic monsoonal cycle, which leads to periodic flooding and drought.

Almost every cultivable acre of land is under crops: rice, wheat, jute, and tea.

The southern part of the country lying on the Bay of Bengal is subject to tropical storms.

Half of the country is less than five meters above sea level.

Bangladesh has few mineral resources.

Bangladesh has a weak industrial base and a largely unskilled labor force; 60 percent of the labor force is engaged in agriculture.

CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS

BACKGROUND

Atmosphere:

The Earth's atmosphere is made up of a combination of gases and suspended particles. These properties are essential to sustain life. The atmosphere provides humans with oxygen to breathe and water to drink; plants with carbon dioxide and water to grow; and the whole planet with a regulated temperature. ◦ The climate of a particular region is determined by the state of the atmosphere and its chemical components. Climate changes result from altering the concentration of such gases and particles.

Greenhouse Effect:

Energy from the Sun strikes the Earth's atmosphere. Much of it bounces back into space, but some is absorbed by carbon dioxide and other gases as heat. This phenomena, which warms the atmosphere, is called the "greenhouse effect." ◦ The right amount of greenhouse effect is necessary for maintaining life on this planet. If heat were not absorbed, the world would be colder and uninhabitable; as more greenhouse gases are released into the atmosphere, more of the Sun's energy is trapped and the world temperature is raised. ◦ There have been fluctuations of greenhouse gases throughout history.

Greenhouse Gases:

Both natural processes and human activities result in emissions of greenhouse gases, which include carbon dioxide (CO_2), methane, and chlorofluorocarbons (CFCs). CO_2 accounts for 50 percent of greenhouse gases. Methane and CFCs account for about 30 percent of the greenhouse effect, and their concentrations are rapidly increasing. The source of methane emissions include rice fields, cattle, biomass burning, and mining. CFCs are used primarily as refrigerants in air conditioners and refrigerators, aerosols, and packaging.

Carbon Dioxide:

Carbon dioxide is emitted by the respiration of animals and plants, the burning of biomass and of fossil fuels, and the manufacturing of cement. People burn fossil fuels for many different purposes, including electricity generation, motorized transportation, air conditioning, heating, etc. ◦ The large scale clearing of tropical forests puts more carbon dioxide into the atmosphere as the cut trees decompose and stop converting carbon dioxide to oxygen.

FACTS:

- Carbon dioxide and other greenhouse gases have become more concentrated in the atmosphere because of greater industrial and agricultural production.
- Carbon dioxide emissions have increased exponentially since the mid-19th century. The amount of carbon dioxide in the world's atmosphere has increased from about 265 parts per million by volume (ppmv) to 350 ppmv today.
- Most scientists agree that the rising level of greenhouse gas emissions is contributing to global warming and if the trend in carbon dioxide emissions continues, world temperatures will increase.
- During the last century, global surface temperatures have risen approximately 1°C and the global average sea level has risen approximately 10 cm.
- Projections of future sea-level rise range from 0.3 meters to 3.5 meters by the year 2100.

CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS *continued*

POTENTIAL CONSEQUENCES:

- If CO_2 concentrations double, the temperature rise could range from 1.5 to 4.5°C (3 to 8°F). It is currently projected that this will happen by 2050.
- Large scale climate changes may occur unless other climatic systems counteract the warming effect of carbon dioxide and other greenhouse gases.
- Several degrees of warming will mean greater variations in both temperature and weather patterns as ice caps and glaciers melt and ocean levels rise. These changes will produce higher sea levels and flooding of low-lying coastal lands worldwide. Melting of just half the world's current volume of ice would produce a rise in sea level of 40 meters (130 feet).
- Given the latest forecasts of atmospheric warming, by 2050 sea level will be 3 to 6 meters (10-20 feet) higher. That could submerge vast areas of low-lying coastal land, including major river deltas. Some major population centers that would be greatly affected because of their low-lying locations include: 1) New Orleans, most of which lies at or below sea level; 2) The Netherlands, where most of the 14 million people live at elevations ranging from a few meters above to several meters below sea level; 3) Alexandria, Egypt, which lies only 1 meter above sea level; and 4) New York and Hong Kong. More than 100 million people worldwide would be displaced.
- Winters could get warmer and warm weather hot spots could become more frequent and severe.
- Rainfall would increase, but the pattern of change would be unequal. Some areas already prone to flooding might flood more often and more severely, and some arid areas might become even dryer. Hurricanes could become stronger as the oceans heat up.
- Climate change would affect agriculture because of changing temperature, rainfall patterns, shifting climate zones, and reduced soil moisture. Farmers may be able to adapt by changing the types of crops that they plant. In some areas, the growing season could become longer, and in other areas, yields would be reduced due to less favorable rains, extreme weather conditions, and reduced soil productivity.
- The physical impacts of sea-level rise include inundation of low-lying areas, erosion, saltwater intrusion, higher water tables, and increased storm damage and flooding.

POTENTIAL CONSEQUENCES FOR BANGLADESH:

People living in the world's river deltas and coastal lowlands will be among the first to suffer from sea-level rise. The effects will be worse where, as in many areas, the land is sinking anyway, compounding the impact of the swelling oceans.

Bangladesh probably faces the greatest crises of all. Eighty percent of the country is made up of the delta of the Ganges, Brahmaputra, and Meghna rivers; half of it is less than 5 meters above sea level. The high population density in Bangladesh forces people to live on low-lying, vulnerable land that would be swept away if the sea level were to rise.

- In one best case scenario, researchers find that sea level would rise about 13 centimeters by 2050, and less than 1 percent of the nation's land area would be lost to advancing seas. In a worse case scenario, 18 percent of the land, which currently supports about 15 percent of the nation's people, would be lost. In the worst case, by 2100 waters would rise to 4.5 meters and cover an area currently supporting 35 percent of the nation's population. The land area that supports nearly one-third of the nation's current GNP would vanish into the sea.

- Estimates show that a 1 meter sea-level rise would destroy 2 million houses and leave 10 percent of the people homeless. An additional sea-level rise would also be felt upstream. Salinity would penetrate inland, poisoning cropland and polluting the water supplies of cities.

UNCERTAINTIES:

- It is unknown exactly how much Earth's surface temperature will rise.

- The level of climate change is dependent on many factors, such as clouds. As the atmosphere gets warmer, it should get cloudier. An increase in certain types of clouds could reduce the warming.

- It is unclear exactly how the accelerated warming will translate into sea-level rise, because the dynamics between the atmosphere and the ocean are not well understood.

- Much is unknown in the area of climate change. Scientists do not yet fully understand the carbon cycle, and cannot account for all the carbon dioxide in the atmosphere. But what changes can be measured, as well as the threat that damage done so far may be irreversible, have made action on climate change urgent.

- The exact effects of climate change are not known.

INTERNATIONAL RESOLUTIONS

- In 1988, the United Nations Environment Programme and the World Meteorological Organization set up the Intergovernmental Panel on Climate Change as an independent scientific and technical body to assess knowledge on climate change; examine the environmental, economic, and social impacts of climate change; and formulate responses and strategies.

- In 1988, the United Nations General Assembly adopted a resolution recognizing climate change as a common concern of humankind and urging the world community to deal with it as an urgent priority.

- In 1989, at an international conference held in India, industrialized countries were reminded that they were mostly responsible for causing climate change, and therefore had an obligation to help developing countries find appropriate answers and finance responses.

- Before the 1992 Earth Summit, 154 nations and the Economic Community had signed the Framework Convention on Climate Change (FCCC). The FCCC's ultimate objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.

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The Key Principles of the Convention
The climate system should be protected for the benefit of present and future generations. The idea of "common but differentiated responsibility" was put forward, meaning that all countries must prevent any further damage of the atmosphere, but some countries have a greater responsibility than others because their contribution to degradation has been greater. Developed countries bear a special responsibility to take action, since they are the largest source of the problem.

The second principle highlights the particular needs and circumstances of developing countries, especially those particularly vulnerable to the effects of climate change and those which would bear a disproportionate burden under the convention.

The third principle calls on countries to take precautionary measures to "anticipate, prevent, or minimize" the causes of climate change. It specifically says that lack of conclusive scientific evidence should not block efforts to act against causes of climate change. This is based on the understanding that to wait for final proof may be too late.

Commitments and Obligations
Both developed and developing countries must adopt national update programs to mitigate climate change; develop adaptation strategies; promote sustainable management and conservation; develop forests; minimize adverse effects by taking climate change into account when setting relevant social, economic, and environmental policies; cooperate in technical, scientific, and educational matters; and promote scientific research and the exchange of information.

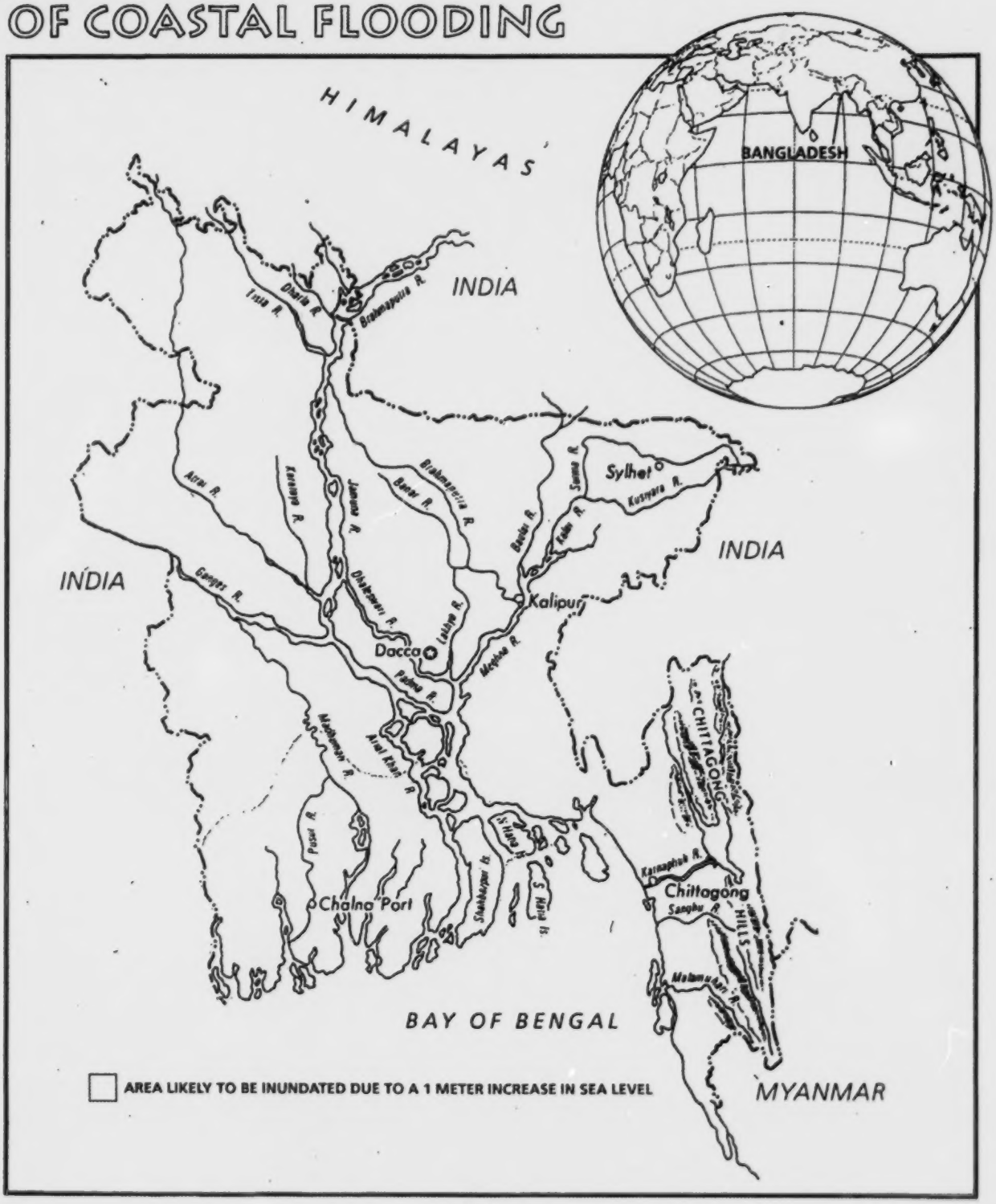
Developed countries must help developing countries by providing technical assistance and financial resources.

Least developed countries and those particularly vulnerable to climate change for geographical reasons are given special consideration. These countries make up a long list that includes small island countries, countries with low-lying coastal areas, areas prone to natural disasters, and areas with high urban atmospheric pollution.

Developed countries are committed to adopting policies that limit human-made emissions of greenhouse gases and enhance greenhouse sinks and reservoirs (forests). These countries must submit the plans that they have developed to reduce emissions to 1990 levels.

CASE STUDY 2, MAP 1

BANGLEDESH: AREAS AT RISK OF COASTAL FLOODING



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LESSON 4

PLANET EARTH: HOME TO US ALL

Introduction:

A healthy environment is in everyone's best interest. It is also everyone's responsibility. It depends on people in less developed countries whose struggle to meet their basic needs and improve their quality of life threatens Earth's systems with irreparable damage. It also depends on people in highly developed countries whose standards of living and levels of consumption place enormous strains on the Earth's resources and global life support systems. Earth is home to us all; therefore, we must all work together to ensure that future generations will be able to meet their basic human needs. In this learning activity, students will collaborate on an action plan for responsible global citizenship. Reflecting on concepts introduced in earlier lessons and case studies, they will develop a series of public service announcements informing the public at large of our shared responsibility and our need to act—as individuals, as a country, and as a global community.

Grade Level:

6-12

Time Required:

One to two class periods

Standards Addressed:

Geography standards

18.	*Knows and understands how to apply geography to interpret the present and plan for the future*

Science standards

F, grades 5-8	*Science and technology in society*
F, grades 5-8	*Natural resources, Environmental quality,* and *Science and technology in local, national, and global challenges*

Skills:

This learning activity requires students to:

- ask geographic questions
- acquire geographic information
- organize geographic information
- analyze geographic information
- answer geographic questions

Vocabulary/Concepts:

global environmental stress, basic human needs, sustainable development

Objectives:

As a result of completing this learning activity, students will:

- formulate a sustainable action plan to address environmental stress.
- create a public service announcement to promote awareness and action focusing on one area of environmental concern.

Materials:

- Transparency of the "lifeboat" cartoon
- Copies of Handout, "Sustainable Action for the Global Environment"
- Chart paper
- Paper, pens, colored pencils, markers

The Learning Activity:

Background:

An essential message of Earth Day and of the lessons in this unit is the concept of "connectedness." There are two perspectives on the "lifeboat" symbol. One perspective suggests that those who are in the lifeboat, i.e., those with access to basic needs and more, will survive while those outside the lifeboat face a grim future with little hope. A counter perspective, however, sees the entire planet as a single lifeboat in which we all, rich and poor alike, ultimately share a common fate. Our futures are connected because damage to any one Earth system has an impact on every other system. And it is upon these interconnected systems of land, water, and air that all life depends.

It is important for the future well-being of the Earth that people understand that all systems, including human systems, are connected, and that just as we all depend on the environment to meet our basic needs, so do we all share responsibility for the health of the environment. From such an understanding will positive actions emerge to correct the damage already done and to develop sustainable strategies for meeting the needs of all people.

Introducing the Activity:

Put the "lifeboat" cartoon on an overhead and read the narrative passage to the class.

- What is the cartoonist trying to say?
- How does this cartoon relate to the lessons we have studied up to this point?

Call attention to the fact that the cartoonist has projected an important message through a single picture. Note that in today's world of images and sound bites, one of the most effective ways to get across important messages is through advertisements and public service announcements that depend heavily on images, symbols, and short phrases that catch and hold the attention of the viewer while delivering a crucial message.

Executing the Activity:

1. Distribute copies of the chart, "Sustainable Action for the Global Environment." Briefly discuss the headings on the chart. Then encourage students, working in six small groups, to draw on the earlier lessons to generate ideas in response to each heading. Have students recreate this chart on poster paper with markers and record their responses there.

   For example, under the heading "How do we correct what we have done?" students might suggest actions to correct air quality problems. They should consider actions that could be taken at the individual level, at the national level, and at the global level. As they deliberate, they should focus on issues of feasibility and sustainability. They should also take into account the costs and benefits of the action they propose.

   Under the heading "How do we meet human needs in environmentally sustainable ways?" students might suggest actions to ensure an adequate food supply for all people without damaging Earth's systems. Again, they should consider actions that could be taken at the individual level, at the national level, and at the global level. As they deliberate, they should focus on issues of feasibility and sustainability. They should also take into account the costs and benefits of the action they propose.

2. When the charts are completed, discuss the responses and record class ideas on a large sheet of chart paper. When the chart is finished, cut out the square and give each group one of the numbered boxes. Then assign each of the six groups one box from the chart. The task of each group is to create a Public Service Announcement (PSA), selecting one idea from the box. The purpose of the PSA is to:

   a) inform the public of one specific environmental issue; and
   b) propose specific actions that can be taken in response to the issue.

   Provide examples of the different types of PSAs that students could develop (e.g., television commercial, radio announcement, message, Internet page, poster, cartoon, magazine or newspaper advertisement, etc.). Students should be encouraged to apply creativity and hard facts to produce an engaging message that presents the current situation and offers positive alternatives for the future.

Concluding the Activity:

After presentations of PSAs have been made to the class, arrange for students to present their PSAs to the school or post them on a school bulletin board. Other options may be to inquire at a local public library about posting the students' work or contact a local radio or television station about airing student work.

Follow-up:

Invite a panel of students and faculty (and/or local civic leaders) to select the best PSAs. Submit their choices to Population Reference Bureau. The best submissions will be recognized on PRB's Internet site. Students who submit their PSAs will receive a certificate. The deadline for submissions to PRB is May 15, 1997.

Extensions & Variations:

For classes with on-line access, the public service announcements could be prepared in digital format and submitted to PRB via the Internet. Send message to: *cstauffer@prb.org.*

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LESSON 4, HANDOUT

Sustainable Action for the Global Environment

How do we ... / How do we respond as ...	Correct what we have done to the environment?	Meet human needs in environmentally sustainable ways?
Individuals	1	2
A country	3	4
A global community	5	6

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WORLD POPULATION AND THE ENVIRONMENT DATA SHEET

	Population (millions) mid-1996	Natural Increase (annual, %)	Projected Population (millions) 2025	Child Mortality Rate (< age 5) per 1,000 1994	Percent Under Age 5 Under-weight 1980–94	Water Available Per Capita (cubic meters) 1990	Water Available Per Capita (cubic meters) 2025	Percent with Access to Safe Water 1990–95	Percent with Adequate Sanitation 1990–95	Cropland Available Per Capita (hectares) 1990	Cropland Available Per Capita (hectares) 2025	GNP Per Capita Adjusted for PPP (US$) 1994	CO_2 Emissions Per Capita (metric tons) 1992
WORLD	**5,771**	**2**	**8,088**	—	—	—	—	—	—	—	—	—	—
AFRICA	**732**	**3**	**1,462**	—	—	—	—	—	—	—	—	—	—
Algeria	29.0	2.4	47.2	65	9	690	378	79	77	0.31	0.17	5,330	3.02
Angola	11.5	2.7	26.6	292	—	17,185	5,936	32	16	0.37	0.13	—	—
Botswana	1.5	2.7	3.0	54	*15*	14,107	6,040	93	55	1.08	0.46	5,320	1.60
Burkina Faso	10.6	2.8	20.9	169	30	3,116	1,293	78	18	0.40	0.16	770	0.06
Cameroon	13.6	2.9	29.2	109	14	18,046	7,130	50	50	0.61	0.24	1,970	0.18
Chad	6.5	2.6	12.9	202	—	6,843	2,944	24	—	0.58	0.25	740	0.04
Côte d'Ivoire	14.7	3.5	33.4	150	12	6,180	2,010	72	54	0.31	0.10	1,340	0.49
Egypt	63.7	2.2	97.6	52	9	1,046	605	80	50	0.05	0.03	3,610	1.54
Ethiopia	57.2	3.1	129.7	200	*48*	2,320	867	25	19	0.29	0.11	410	0.05
Ghana	18.0	3.0	38.0	131	27	3,529	1,395	56	42	0.18	0.07	2,020	0.24
Guinea	7.4	2.4	13.1	223	—	39,270	14,979	55	21	0.13	0.05	—	0.17
Kenya	28.2	2.7	49.1	90	22	635	237	53	77	0.10	0.04	1,350	0.22
Madagascar	15.2	3.2	34.4	164	39	3,182	1,162	29	3	0.25	0.09	670	0.08
Mali	9.7	3.1	23.7	214	*31*	6,730	2,523	37	31	0.23	0.09	520	0.05
Morocco	27.6	2.2	40.7	56	9	1,151	689	55	41	0.38	0.23	3,440	1.08
Mozambique	16.5	2.7	35.1	277	—	4,088	1,651	33	*20*	0.22	0.09	550	0.07
Niger	9.5	3.4	22.4	320	36	5,691	1,966	54	15	0.47	0.16	800	0.13
Nigeria	103.9	3.1	246.0	191	36	3,203	1,292	40	35	0.34	0.14	1,430	0.95
Rwanda	6.9	2.7	13.7	139	29	902	399	66	58	0.17	0.07	—	0.06
Senegal	8.5	2.7	16.9	115	20	4,777	2,071	52	58	0.32	0.14	1,660	0.36
South Africa	44.5	2.3	70.1	68	—	1,349	705	70	—	0.36	0.19	—	7.49
Sudan	28.9	3.0	58.4	122	20	4,913	2,069	60	22	0.52	0.22	—	—
Tanzania	29.1	3.0	56.3	159	29	2,969	1,208	50	64	0.13	0.05	—	0.08
Tunisia	9.2	1.7	13.4	34	*10*	540	328	99	96	0.60	0.37	4,960	1.60
Uganda	22.0	3.3	37.4	185	23	3,677	1,373	34	57	0.37	0.14	940	0.05
Zaire	46.5	3.2	107.6	186	28	27,220	9,738	27	23	0.21	0.08	—	—
Zambia	9.2	3.0	18.5	203	25	11,779	5,018	50	37	0.65	0.28	1,000	0.29
Zimbabwe	11.5	2.5	17.3	81	*12*	2,323	1,172	77	66	0.28	0.14	2,040	1.82
EUROPE	**728**	**-0.1**	**743**	—	—	—	—	—	—	—	—	—	—
Albania	3.3	1.7	4.6	41	—	6,385	4,499	—	—	0.21	0.15	—	1.24
Austria	8.1	0.1	8.2	7	—	11,681	10,893	—	—	0.20	0.18	20,230	7.15
Czech Republic	10.3	-0.1	10.6	10	—	5,848[a]	5,470[a]	—	—	0.33[a]	0.31[a]	7,910	13.15
Denmark	5.2	0.2	5.4	7	—	2,529	2,559	—	—	0.50	0.51	20,800	10.42
France	58.4	0.3	63.6	9	—	3,262	3,021	—	—	0.34	0.31	19,820	6.31
Germany	81.7	-0.1	79.3	7	—	2,520	2,616	—	—	0.16	0.16	19,890	10.89
Greece	10.5	0.1	10.0	10	—	5,763	5,979	—	—	0.38	0.40	11,400	7.16
Hungary	10.2	-0.3	9.3	14	—	11,095	12,238	—	—	0.51	0.56	6,310	5.80
Ireland	3.6	0.5	3.8	7	—	14,273	12,880	—	—	0.27	0.24	14,550	8.69
Italy	57.3	0.0	54.4	8	—	3,279	3,574	—	—	0.21	0.23	18,610	7.17
Netherlands	15.5	0.4	17.4	8	—	6,019	5,530	—	—	0.06	0.06	18,080	9.16
Norway	4.4	0.4	5.0	8	—	97,383	87,519	—	—	0.20	0.18	21,120	14.06
Poland	38.6	0.2	40.5	16	—	1,469	1,348	—	—	0.39	0.35	5,380	8.91
Russia	147.7	-0.5	153.1	31	—	19,493[a]	17,733[a]	—	—	0.79[a]	0.72[a]	5,260	14.14
Spain	39.3	0.1	34.6	9	—	2,826	2,954	—	—	0.51	0.54	14,040	5.72
Sweden	8.8	0.1	9.6	5	—	21,030	18,460	—	—	0.33	0.29	17,850	6.55
Switzerland	7.1	0.3	7.5	7	—	7,316	6,422	—	—	0.06	0.05	24,390	6.36
Ukraine	51.1	-0.5	54.0	25	—	—	—	—	—	—	—	3,330	11.72
United Kingdom	58.8	0.2	62.5	7	—	2,090	1,952	—	—	0.12	0.11	18,170	9.76
Yugoslavia	10.2	0.3	10.6	23	—	11,549[a]	10,780[a]	—	—	0.34[a]	0.31[a]	—	—

Note: This data sheet includes selected countries only. Many countries with a population under 5 million were excluded. In addition, the following countries were not included due to lack of information: Azerbaijan, Georgia, Hong Kong, Lithuania, and Puerto Rico.

— Indicates data unavailable or inapplicable.
Italics indicate data collected from a year or period other than the one listed.
[a] Figure is for the former Czechoslovakia (the Czech Republic and Slovakia).

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	Population (millions) mid-1996	Natural Increase (annual, %)	Projected Population (millions) 2025	Child Mortality Rate (< age 5) per 1,000 1994	Percent Under Age 5 Underweight 1980–94	Water Available Per Capita (cubic meters) 1950	Water Available Per Capita (cubic meters) 2025	Percent with Access to Safe Water 1990–95	Percent with Adequate Sanitation 1990–95	Cropland Available Per Capita (hectares) 1990	Cropland Available Per Capita (hectares) 2025	GNP Per Capita Adjusted for PPP (US$) 1994	CO_2 Emissions Per Capita (metric tons) 1992
NORTH AMERICA	**295**	**0.6**	**372**	—	—	—	—	—	—	—	—	—	—
Canada	30.0	0.6	36.6	8	—	104,386	75,811	—	—	1.65	1.20	21,320	14.36
United States	265.2	0.6	335.1	10	—	9,915	7,483	—	—	0.75	0.57	25,860	19.11
LATIN AMERICA & THE CARIBBEAN	**486**	**1.9**	**678**	—	—	—	—	—	—	—	—	—	—
Argentina	34.7	1.2	46.5	27	—	30,540	21,546	71	68	0.84	0.59	8,920	3.50
Bolivia	7.6	2.6	13.1	110	16	45,641	22,847	55	55	0.35	0.18	2,520	0.96
Brazil	160.5	1.7	202.3	61	7	46,809	30,185	87	83	0.40	0.26	5,630	1.41
Chile	14.5	1.6	18.1	15	3	35,579	23,666	85	83	0.33	0.22	9,060	2.55
Colombia	38.0	2.1	52.7	19	10	33,127	21,678	87	63	0.17	0.11	5,970	1.76
Costa Rica	3.6	2.2	5.5	16	2	31,301	16,940	92	97	0.17	0.09	5,760	1.20
Cuba	11.0	0.7	12.4	10	—	3,303	2,765	93	66	0.31	0.26	—	—
Dominican Republic	8.1	2.3	11.7	45	10	2,813	1,791	76	78	0.20	0.13	3,790	1.40
Ecuador	11.7	2.3	17.8	57	17	30,592	17,648	71	48	0.27	0.15	4,380	1.76
Guatemala	9.9	2.9	17.0	70	34	12,613	5,354	62	60	0.20	0.09	3,490	0.58
Haiti	7.3	2.3	11.2	127	27	1,696	838	28	24	0.14	0.07	930	0.12
Mexico	94.8	2.2	142.1	32	14	4,224	2,614	83	50	0.29	0.18	7,050	3.92
Nicaragua	4.6	2.7	9.1	68	12	47,606	19,275	58	60	0.35	0.14	1,850	0.64
Peru	24.0	2.1	33.9	58	11	1,853	1,090	71	57	0.17	0.10	3,690	1.00
Venezuela	22.3	2.1	34.8	24	6	67,532	37,872	79	59	0.20	0.11	7,890	5.75
ASIA	**3,501**	**1.6**	**4,898**	—	—	—	—	—	—	—	—	—	—
Afghanistan	21.5	2.8	45.3	257	—	3,323	1,105	12	—	0.54	0.18	—	—
Bangladesh	119.8	2.0	175.8	117	67	21,800	12,018	97	34	0.09	0.05	1,350	0.15
Cambodia	10.9	2.9	22.8	177	40	56,328	25,297	36	14	0.35	0.16	—	—
China	1,217.6	1.1	1,492.0	43	17	2,424	1,835	67	24	0.08	0.06	2,510	2.29
India	949.6	1.9	1,384.6	119	69	2,451	1,498	81	29	0.20	0.12	1,290	0.87
Indonesia	201.4	1.6	276.5	111	40	13,839	9,180	62	51	0.12	0.08	3,690	1.00
Iran	63.1	2.9	106.8	51	—	2,002	955	84	67	0.26	0.12	4,650	3.97
Iraq	21.4	3.7	52.6	71	12	6,029	2,555	44	70	0.30	0.13	—	—
Israel	5.8	1.5	8.0	9	—	461	275	—	—	0.09	0.06	15,690	8.13
Japan	125.8	0.2	125.8	6	—	4,428	4,499	97	—	0.04	0.04	21,350	8.79
Kazakhstan	16.5	0.9	20.5	48	—	—	—	—	—	—	—	2,830	17.55
Korea, North	23.9	1.9	32.1	31	—	3,077	2,007	—	—	0.09	0.06	—	—
Korea, South	45.3	0.9	50.8	9	—	1,470	1,158	93	100	0.05	0.04	10,540	6.64
Kuwait	1.8	2.3	3.4	14	6	75	57	—	—	0.00	0.00	24,500	11.42
Malaysia	20.6	2.4	34.5	15	23	25,488	14,441	78	94	0.27	0.15	8,610	3.76
Myanmar (Burma)	46.0	1.9	72.2	109	32	25,877	14,319	38	36	0.24	0.13	—	0.10
Nepal	23.2	2.6	43.5	118	70	8,830	4,178	46	21	0.14	0.07	1,080	0.07
Pakistan	133.5	2.9	232.9	137	40	3,838	1,643	79	33	0.17	0.07	2,210	0.60
Philippines	72.0	2.1	113.5	57	34	5,314	3,090	85	69	0.13	0.08	2,800	0.77
Saudi Arabia	19.4	3.2	50.3	36	—	284	107	95	86	0.15	0.06	—	13.11
Sri Lanka	18.4	1.5	23.2	19	38	2,496	1,718	53	61	0.11	0.08	3,150	0.29
Syria	15.6	3.7	31.7	38	—	2,089	770	85	83	0.46	0.17	—	—
Thailand	60.7	1.4	75.1	32	26	3,220	2,433	86	74	0.41	0.31	6,870	1.98
Turkey	63.9	1.6	91.8	55	10	3,619	2,232	80	—	0.49	0.30	4,610	2.49
Uzbekistan	23.2	2.3	42.3	64	—	—	—	—	—	—	—	2,390	5.74
Vietnam	76.6	2.3	118.8	46	42	5,638	3,182	36	22	0.10	0.05	—	0.31
Yemen	14.7	3.2	36.6	112	30	460	154	55	65	0.14	0.05	—	0.73
OCEANIA	**29**	**1.1**	**39**	—	—	—	—	—	—	—	—	—	—
Australia	18.3	0.8	23.1	8	—	20,310	13,905	—	—	2.90	1.99	19,000	15.33
New Zealand	3.6	0.9	4.3	9	—	118,155	90,722	97	—	0.12	0.09	16,780	7.60

b Figure is for the former USSR.
c Figure is for the former Yugoslavia, not the present Yugoslavia (Serbia and Montenegro).

World Population and the Environment Data Sheet Definitions and Sources

Population 1996: Estimates are for mid-1996 and are based on information from a recent census, official national data, the United Nations, or U.S. Census Bureau projections.

Data from *World Population Data Sheet 1996* by the Population Reference Bureau, Inc., Washington, DC: PRB, June 1996

Rate of Natural Increase: The rate at which a population is increasing (or decreasing) in a given year due to a surplus (or deficit) of births over deaths, expressed as a percentage. This rate does not include the effects of immigration or emigration.

Data from *World Population Data Sheet 1996* by Population Reference Bureau, Inc., Washington, DC: PRB, June 1996

Projected Population in 2025: Projected population in 2025 is based on assumptions of future fertility, mortality, and migration. Projections are drawn from official country projections, or on series issued by the UN, U.S. Census Bureau, or PRB projections.

Projections from *World Population Data Sheet 1996* by Population Reference Bureau, Inc., Washington, DC: PRB, June 1996

Child Mortality Rate: The estimated number of children born in a given year who will die before reaching age five per 1,000 live births in that same year. The rate was derived from data in 1994.

Following the 1990 World Summit for Children, almost all the world's governments agreed that under-five death rates should be reduced by the year 2000 to a rate of no more than 70 per 1,000 live births. The ICPD Programme of Action set a goal for 2015 to reduce rates to below 45 deaths per 1,000 live births.

Rates from *The State of the World's Children 1996* by UNICEF, New York: Oxford University Press, 1996

Percent of Children Under Five Years Suffering from Moderate and Severe Underweight: The proportion of children under the age of five who are below the average weight for their age and population. Those who suffer from malnutrition may simply have too little food to eat or may lack certain essential nutrients. Too little food creates a condition know as protein-energy malnutrition (PEM) caused by protein and energy deficiencies. The effects of deficiencies are made worse by infections that raise nutrient requirements and reduce the body's ability to digest food. PEM is the prime cause of low birth weight and poor growth among children in the developing world.

Data from *The State of the World's Children 1996* by UNICEF, New York: Oxford University Press, 1996

Per Capita Water Availability 1990 and Projected Per Capita Water Availability 2025 (Medium Projection): The amount of cubic meters of water available per person. Water availability is calculated from measurements of stream flow within countries minus the amount of evaporation based on local climate.

Water stress occurs when the annual availability of renewable fresh water is less than about 1,700, but greater than 1,000 cubic meters per person in the population.

Water scarcity occurs when the annual availability of renewable fresh water is 1,000 or fewer cubic meters of water per person in the population.

Data from *Sustaining Water: An Update* by Robert Engelman and Pamela LeRoy, Washington, DC: Population Action International, 1995

Percent of Population with Access to Safe Water and Sanitation 1990-1995: The proportion of persons with reasonable means of getting clean drinking water, including treated surface water and untreated but not contaminated water from springs, boreholes, and wells. For urban areas, "reasonable" access means that there is a public fountain or water spigot within 200 meters of the household. For rural areas, it implies that people do not have to spend excessive time each day fetching water. Access to sanitation is defined as the proportion of people served by connections to public sewers or household disposable systems that collect waste water and then clean and redistribute it. The percentage is calculated for a specific period between 1990 and 1995.

As a goal for the year 2000, almost all the world's governments agreed that 100 percent of all communities should have safe water and sanitation.

Data from *The State of the World's Children 1996* by UNICEF, New York: Oxford University Press, 1996

Per Capita Cropland Availability 1990 and Projected Per Capita Cropland Availability 2025 (Medium Projection): The amount of hectares of arable land available per person. Arable land is land fit for crop production, including permanent meadows and pastures. The quality varies considerably according to land slope, soil structure, and climate.

The minimum amount of arable land required per person to sustain a largely vegetarian diet, without the use of intensive fertilizers and pest controls, is 0.07 hectares. Projected availability in 2025 is based on 1992 long-range regional projections and 1994 country projections.

Data from *Conserving Land: Population and Sustainable Food Production* by Robert Engelman and Pamela LeRoy, Washington, DC: Population Action International, 1995

GNP per capita adjusted for purchasing power (PPP): The Gross National Product (GNP) is the total amount of goods and services produced by a country in a year. GNP per capita expresses this amount as if each individual had an equal share, but GNP per capita is not the average money income for an individual. In this Data Sheet, the GNP per capita is given in terms of purchasing power parity (PPP). PPP is the number of units of a country's currency required to purchase the same type of goods and services that a U.S. dollar would buy in the United States. The concept of PPP is similar to that of market exchange rates, although PPP is favored when analyzing social dimensions of economic development. Simply put, PPP compares the cost of goods in the purchasing power of each country's currency in that country to what the same things might cost in the United States. The price levels of various baskets of basic consumption items can be used to develop an international price index of basic needs.

Data from *The World Bank Atlas 1996* by The World Bank, Washington, DC: World Bank, 1995

Per Capita CO_2 Emissions: The amount of carbon dioxide (CO_2) emitted in metric tons per person from industrial processes: solid fuels, liquid fuels, gas fuels, gas flaring, and cement manufacturing. The total amount of emissions is based on the net apparent consumption of fossil fuels and the world cement manufacture, activities associated with the industrialization process. These emissions reflect how industrialized a country is and how much energy its people consume. Per capita emissions are calculated from aggregate emissions and population estimates for 1992.

Data from *World Development Report 1996* by The World Bank, New York: Oxford University Press, 1996.

Classroom Guide
Definitions and Conversions

CARE (Cooperative for Assistance and Relief Everywhere, Inc.): CARE is the world's largest private relief and development organization assisting the world's people to achieve social and economic well-being.

Hectares: 1 hectare = 2.47 acres.

Nongovernmental Organization (NGO): an organization not established by government, not primarily profit-making, and which in some way promotes the public good—for example, humanitarian organizations, cooperatives, women's groups, farmers' organizations, environmental organizations.

Pan American Development Foundation (PADF): PADF is a private, U.S.-based, voluntary organization working to strengthen poor people throughout Latin America and the Caribbean.

Square Kilometers (km^2): 1 square kilometer = 0.3861 square miles.

Sustainable Development: Practices in agriculture, economic development, health, and education that lead to progress and meet the needs and desires of the current generation without decreasing the ability of future generations to meet their needs.

United Nations Development Programme (UNDP): UNDP is a division of the United Nations set up to promote human development by helping developing countries to fight poverty, ignorance and disease, to conserve the environment, to stimulate technology, and to enhance the contributions of women.

U.S. Agency for International Development (USAID): USAID is an independent, governmental agency that provides economic development and humanitarian assistance to countries overseas.

World Bank: The World Bank is an international organization owned by member governments. It makes loans to developing country governments in support of projects or economic reforms.

Note: The essays in this classroom guide use both British and American terms. Here are some examples of different spellings:

British	American
catalogue	catalog
colour	color
labour	labor
programme	program